

AN ETHICAL SYSTEM

BASED ON THE LAWS OF NATURE

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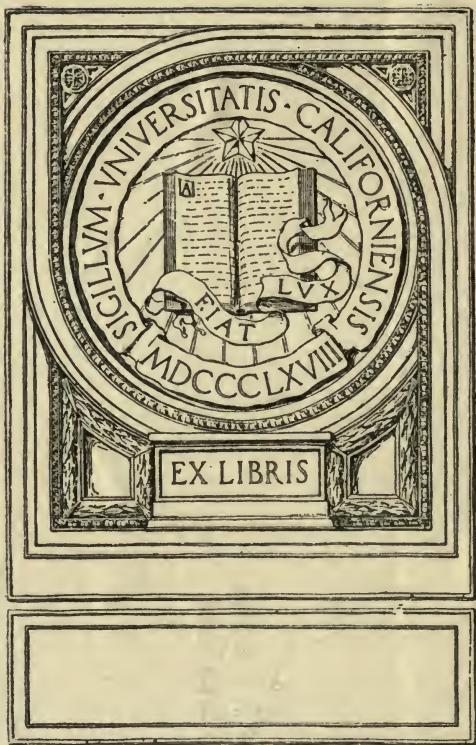
M. DESHUMBERT

Translated from the French by
LIONEL GILES, M.A., D.Litt.

This book has already appeared in
seven languages, and will shortly
appear in three others

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BY

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11

TRANSLATED FROM THE FRENCH

BY

LIONEL GILES, M.A., D.Litt.

WITH A PREFACE

BY

C. W. SALEEBY, M.D., F.R.S.Edin.



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"We live only by the general harmony of our
acts with the Laws of Nature."

PREFACE

THE author of this patient, sincere, and searching work has done me the honour to ask for a preface from my pen. The task of writing it comes when I am almost overweighted with other work on behalf of the physical and moral protection of the men who are now giving their all in order that the principles of doing justice and loving mercy shall prevail and rule the coming world. Therefore I am more than ever inadequate for the present theme, and I apologise accordingly to M. Deshumbert and the reader.

It needs no special study nor discernment, however, to see that this book is a real contribution to the didactic literature, as yet so scanty and inchoate, of the Religion of Life. The days when evolution—an idea as old as the Buddha and Heracleitus—was thought to be new, and therefore fit for fashionable argument, are long past. The twentieth century is making history so rapidly that we are in danger of forgetting the colossal record of the nineteenth in destroying lies and establishing truth. But the line of Spencer and Darwin is not extinct. In France M. Bergson, in Sweden

Miss Ellen Key, are making contributions to the theory and the practice of that Religion of Life which is founded in its modern form upon the evolutionary ethics of Spencer and Darwin. It is in this high company, clearly, that M. Deshumbert must be placed. "To the solid ground of Nature," said Wordsworth, "trusts the mind which builds for aye."

At a date when a world-tragedy offers an opportunity for the abuse of such words as "good" and "right," M. Deshumbert quietly offers us genuine study and thought, in the service of that ever-increasing number of thoughtful persons who know that good is good and evil evil, and who know that such tremendous realities must have bases no less tremendous and real—bases which make all recited creeds appear trivial.

When the young generation, whose mind, no less than its body, is in our care, comes knocking at the door and anxiously or mockingly asks us for the sure foundations and sanctions of right and wrong, seeing that not even the professional teachers of theological morality now believe the things they say, we must be ready with an appeal to the Supreme Court of Nature, and with proofs that the laws of right and wrong are the very laws of life and death.

C. W. SALEEBY.

TRANSLATOR'S PREFACE

WHEN M. Deshumbert's book, *La Morale fondée sur les Lois de la Nature*, first fell into my hands, my interest was aroused by the quotations from Chinese philosophers which appear on the first page. Having made some slight study of Taoism, I was especially struck by certain points of resemblance between that system and the doctrine so clearly expounded in the present treatise.

On closer examination, indeed, it appears that the *aims* of Taoism are practically identical with those professed by the author of *La Morale*, namely, the rejection of artificial codes of morality and the following of Nature herself as our only trustworthy guide. It is Lao Tzŭ's chief title to fame that he regarded man as forming one with the universe, and therefore advocated what was, in effect, a "return to Nature," and a life which should be in complete harmony with its environment. At a time when the respect for antiquated forms and ceremonies was carried to an extreme, this bold breaking with convention and indication of the true criterion of human conduct was an epoch-making step in advance.

But there still remained the all-important question: "What is the real aim or tendency of Nature as manifested in her works?" And to this question it is hardly surprising that the early Taoists should have been unable to furnish an adequate answer. Contemplating the universe around him, Lao Tzū seems to have been chiefly impressed by its unobtrusive tranquillity and the absence of effort which characterises its workings. Hence his message to mankind is summed up in his famous paradox: "Do nothing, and all things will be done." He saw, truly enough, that it is futile and wrong to strive in opposition to Nature, and he did well to insist that we should adapt ourselves to her laws. But it is not on that account necessary to lead a life of utter passivity, to "attain complete vacuity, and sedulously preserve a state of repose." It is hardly fair, perhaps, to criticise Lao Tzū or his successors on the strength of isolated sayings, but in general it may be said that they failed to grasp the significance of the facts in Nature which they wished to take as their model. Modern science has enabled us to penetrate more deeply beneath the surface of things, and we find that the smoothness and calm apparent in the operation of natural laws serves only to cloak a state of intense and unceasing activity, no particle of matter throughout the universe being at rest for a single moment. And the course of evolution, but dimly apprehended by the Taoists, shows that the grand

object pursued by Nature is life—and not merely life in the quantitative sense, but “life reaching the highest pitch of activity, morality, and intelligence.” Thus the system set forth in this little book may be regarded as Taoism purged of its extravagances and misapprehensions, while retaining all the nobler features that have endeared it to so many generations of philosophic minds.

It seems to me, then, that we have here a broad interpretation of Nature and her aims which will satisfy those who are anxious to find a firm and logical basis for human life and conduct. M. Deshumbert had little difficulty, therefore, in persuading me to add another to the many translations of his work. Apart from the contents, it has been a real pleasure to make an English rendering, however imperfect, of thoughts expressed in that most lucid and elegant of prose vehicles, the French language.

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*The present work has already appeared in the
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Bengali	.	„ „	NOREEIDRO NATH SEN.

AN ETHICAL SYSTEM

BASED ON THE LAWS OF NATURE

Part I

Statement of the Theory

ACCORDING to the popular definition, Ethics is the science which teaches us the rules that we must follow in order to do what is right, and to avoid what is wrong.

But these rules, which are the result of an experience limited by time and space, have greatly varied according to the period, the country, and the circumstances. Even in our own days the morality of the poor, the oppressed, and the humble is not the morality of the rich, the powerful, and the great.

Five hundred years before Jesus Christ, Confucius said to his disciples: "Do not unto others what you would not others should do unto you." (*Lun Yü*, chap. xii. art. 2.)

And again: "To be able to make our own feelings the touchstone for our treatment of others may be considered the true ethics of humanity." (*Lun Yü*, chap. vi. art. 28.)

These maxims, though they have been repeated many times since these far-off days, are not always adequate to show us the right way. For, in many

cases, not knowing what is best for ourselves, how can we positively know what would be best for others?

Confucius also said: "Return justice for injustice and good for good." (*Lun Yü*, chap. xiv. art. 36.) Lao Tzŭ, his contemporary, goes further. He says: "To the good I would be good; to those who are not good I would also be good, in order to make them good." (*Tao Tê Ching*, chap. xlix.)

But what is good, and what is evil?

It is not enough to say: "Do what is right, refrain from that which is wrong." It is necessary to specify what these words mean. Where shall we find fixed and certain rules? If a man looks into his own heart, and asks himself this question, will he there find the "Law"? Will his insight be sufficient? Unfortunately not. Is conscience a safe guide and can we follow it blindly? Not always. For conscience is the result of atavism, heredity, education, acquired habits, example, and the surroundings in which we evolve. Necessarily, therefore, it varies according to the period, country, profession, and social position of the individual. And even in the same individual, conscience is far from being constant during his whole life. The conscience of a child is not that of a youth; and the latter differs from that of a man in his prime, which, in its turn, is not identical with that of the aged.

There are even instances of conscience having led men to commit horrible crimes.

We know that amongst many savage tribes it is the duty of the son to kill his father as soon as old age begins to show its weakening influence on the physical condition of the latter. With these communities it is an article of belief that the dead

before attaining to Paradise have to cross immense regions inhabited by evil spirits and ferocious beasts. A dutiful young man obeyed his conscience in killing his relatives before age made them too weak to defeat the cruel beings who resisted their progress. Should a son refuse to assist his father's entrance into heaven, and thus fail to fulfil an elementary duty, he would assuredly feel the stings of a guilty conscience reproaching him with his want of filial love, and his heart would be filled with remorse.

C. Flammarion tells us that "among the savages of Melanesia, parricide was elevated into a duty, the neglect of which would have been considered disgraceful. It was filial compassion that made the Fijians cut their fathers' heads off."

In former times, cannibals were numerous. When conquerors devoured their enemies, it was most commonly from a sense of duty : in order to acquire the warlike virtues of those whom they had killed in battle. If anyone refused to take part in the sacred feast, he was considered to be careless regarding the future glory of his tribe. His conduct was deemed unpatriotic, and his conscience would not fail to accuse him. With numerous tribes, and even with such a civilised people as were the ancient Mexicans, cannibalism was also a religious custom. In proportion as their conscience was more or less sensitive, they were more or less eager for an opportunity of eating their fellow-men.

In other parts of the world, cannibalism was the outcome of filial respect. A son would eat his aged father in order to provide him with a fitting tomb. Witness a remarkable custom which was prevalent among the Battas of Sumatra, a gentle and kindly people. As soon as the father of a family showed

signs of old age, his children asked him to hang by his hands from the branch of a tree, which they then proceeded to shake vigorously, while they chanted these words: "The season has come round, the fruit is ripe, and it is time for it to fall." And, indeed, it was not long before the "fruit" dropped to the ground, whereupon, with much religious solemnity, the father was killed and eaten by his children.

* * *

Again, what are we to think of a conscience admitting slavery? We know that slavery has existed at all times, especially in the East. We know that great slave-markets flourished at Ephesus, Samos, Chios, Cyprus, Athens, Delos, Rome, etc. The institution of slavery was considered by all, even by the Greek philosophers, to be quite legitimate.

The wisest men condemned, not the principle, but the abuse of it. Aristotle goes so far as to say that slavery is a necessary condition of civilisation.

In course of time—that is, about the end of the Middle Ages—slavery properly so called disappeared completely from Europe, although it continued under a milder form, viz. serfdom, which was preserved in certain parts of France until the Revolution. (The monks of the Abbey of Saint-Claude maintained a system of serfdom until 1789.)

Slavery only left Europe to appear in the New World. There, as formerly in the East, at Rome, etc., the slaves belonged body and soul to their masters; they were transmitted by inheritance, by gift, and by sale: they were in every way regarded as domestic animals.

The most civilised (?) nations only abolished slavery in their colonies quite recently. Many

centuries passed without a word of protest from the world's collective conscience! The following are the dates in which slavery was abolished in the colonies of the different countries:—Great Britain, 1833 (liberation of eight hundred thousand slaves); Sweden, 1846; France, 1848 (the Revolution had abolished slavery in the French colonies, but the First Consul re-established it on the 30th floréal, year 10); Denmark, 1848; Portugal, 1856; Holland, 1860; United States, 1866; Spain, 1872 (in Porto Rico, but not in Cuba); Brazil, 1888.

Among all these slave-owners there were certainly a great number of upright men who prided themselves on obeying their conscience; but although that conscience might be ticklish on all other points, it remained mute on the question of slavery, and even approved of it. And when death came, these slave-owners saw it approach without misgiving, honestly thinking that they had nothing with which to reproach themselves. If they had any regret, it was that they could not leave to their children a greater number of slaves. Such was the case in ancient times, and such it remained until a few short years ago. But at last the public conscience was aroused. It would no longer tolerate that men, women, and children should be treated like beasts—beaten, sold, parents violently separated from their children, and wives from their husbands, or that human beings should be denied all liberty, justice, and right.

Not so very long ago, quite good, respectable people sent those who happened to differ from them in religious matters to be tortured and burned at the stake, and, in the majority of cases, it was done solely in obedience to the dictates of conscience. Fair-minded judges who were “slaves to their

conscience" used to condemn so-called witches to be burnt alive.¹ The laws which were applied had been made by legislators who considered themselves just men, and conscientiously believed that they were acting in the true interests of humanity.

Even in our own days, how many virtuous men, trusting to their conscience, do evil, believing on the contrary that they are doing good, and desiring it passionately !

Therefore we can honestly say that there is not one conscience, but a multitude of different consciences. Instead of one guide, we have thousands, who unfortunately do not always agree.

Then what are we to do ? Where and how are we to find an accurate definition of right and wrong ? If we could discover that definition, all that we should have to do would be to develop in ourselves the necessary energy and will-power that that would enable us to do our duty. People, as a rule, are much better than one thinks, and the difficulty generally lies, not in forcing them to do right, for they nearly all desire that, but in being

¹ In Spain, between 1471 and 1781, no fewer than 32,000 heretics were condemned to be burnt at the stake, 291,000 were sentenced to imprisonment or other penalties, and 17,000 were burnt in effigy (Galton, quoted by Th. Ribot). The number of witches that have been hanged or burnt to death in England is estimated at over 30,000. The last victim was executed in Scotland in 1722 (Sir Hiram Maxim). In the duchy of Lorraine, 400 sorcerers perished by fire in twenty years (Gustave Le Bon). That is an average of one sorcerer for every eighteen days. Six thousand five hundred persons supposed to be possessed by devils were executed within the space of a few years in the single principality of Trèves. And, as late as 1874, four sorcerers were burnt alive at Jacopo (Mexico), by order of the Governor Castillo (Binet-Sanglé). In three months, 500 witches were burnt at Geneva, 800 at Wurtzburg, 1500 at Bamberg (A. Grillière). Under the jurisdiction of the Parliament of Bordeaux, in 1609, 600 sorcerers were condemned to death and most of them burnt.

able to tell them with certitude, "*This is right, that is wrong.*"

* * *

The fundamental error of most philosophers, moralists, and founders of religion has been their failure to understand that man is a constituent part of the Universe, an integral portion of Nature and of the Whole. They, on the contrary, thought of man as a being apart, whose "soul" was not subject to the laws of Nature, a being whose "Psyche" was outside and above material forces and without any connection with the Universe. They did not see that as Nature comprises everything that exists—because nothing can exist outside Nature—mankind is necessarily subject to the same laws as the rest of the Universe, and that therefore we ought, like all other beings, to follow the way that Nature points out for us.

Guided by the instinct of self-preservation, man had formed at an early date some general idea of the things that he should do and those that he should avoid in order "to prolong life" and guard against an undue number of unpleasant mishaps. Our remotest ancestors were well aware that, in order to go on living, it was advisable to abstain from certain acts, such as letting oneself fall from the top of a cliff; whereas it was necessary, on the other hand, to perform various other acts, *e.g.* to absorb from time to time a sufficient quantity of food.

But they behaved in this way without realising that they were accommodating themselves to certain laws of Nature.

At a much later period, when the existence of natural laws came to be recognised, our forefathers placed them in the same category as the laws of

man. Their application was supposed to depend on the will of the gods, and to admit of numerous exceptions, it being possible to modify them or to escape from them altogether by means of prayers and offerings.

And this ignorant belief was persisted in for a long time.

At length, after the lapse of centuries, the clouds of error were dispersed, and we know now that our body is the result of a long process of evolution ; that it continues, both in whole and in part, to obey the natural forces which produced this evolution, and that this is a law to which there are no exceptions. (Hence the importance we attach nowadays to hygiene, to physical exercises, and to prophylactic science in general.)

We know further that our mental and moral qualities have been evolved in the same way, and are likewise still subject to the complex workings of these natural forces that brought them to their present stage of development.

That being the case, we should, to be consistent, do for our moral and intellectual life what has already been done on the physical side—endeavour to find out what Nature wants, so that we may obey her commands and live a full, harmonious, normal life in every direction.

Nature is our mother—nay, she is something even more than that ; for not only are we engendered by Nature, but it is in and by her that we live, and to her that we shall return.

This state of close and continual dependence on Nature makes it quite evident that there can be no “happiness,” no “full expansion of our being,” without complete harmony between Nature and ourselves, unless, that is to say, we render whole-

hearted obedience to her laws, and follow with joyful steps along the path that she herself treads.

We live only by the general harmony of our acts with the Laws of Nature. Our will is therefore obliged, as A. Fouillée has said, to be at the same time the will of Nature.

It is wise, then, to make an effort to understand at least the general tendencies of Nature, in order to regulate our conduct accordingly. And these tendencies of Nature are to be sought quite humbly and sincerely; not by musings and vain assumptions, but by a large number of direct observations, patiently and faithfully carried out.

Before going any further, it may be well to see what is meant by the terms "Nature" and "Laws of Nature." We know that whenever like phenomena are produced under like conditions, they are followed by other phenomena which are like to one another. Or, to put it in a more familiar way, the same causes are followed by the same effects. It is this constancy in the succession of phenomena which constitutes what we call the Laws of Nature.

We may add that, inasmuch as the laws of Nature are the expression or the result of the properties inherent in the constitution of things, they cannot be other than they are.

When we speak of Nature, we mean the Cosmos, the Universe, everything that exists—that is to say, the sum of "beings and things" (men, animals, plants, stars, planets, etc.), the totality of "Substance" (matter, energy, forces, etc.), the totality of the "Laws of Nature." In a word, Nature is "All-that-is." In this inquiry, however, we shall restrict the meaning of the word to that part of

the Cosmos with which we are best acquainted, namely, the Earth.

* * *

Now, what does Nature desire? Or, to speak more accurately: What does every plant desire? What does every animal desire? What does every living creature desire? Let us see.

A. von Humboldt, in his *Pictures from Nature*, tells us: "When man questions Nature with a genuine thirst for knowledge, or in his imagination measures the vast spaces of organic creation, the deepest and most powerful emotion which he experiences is the feeling of the overwhelming plenitude of life distributed throughout the Universe." There is, indeed, superabundance of life on every side. We see it covering the surface of the earth, penetrating the soil itself, filling the waters, descending to depths of the ocean where absolute darkness prevails, and, in spite of their low temperature, spreading itself throughout the polar seas.¹ The air, too, is swarming with microscopic forms of life.

¹ Life persists in spite of low temperature. Thus, over 300 different species of algæ occur in the Arctic and Antarctic Oceans. Algæ are found as far north as 80°, where the water is never much above freezing-point. The *Scotia* brought back from its expedition in the Antarctic seas (71° 22' S. by 16° 44' W.) specimens of more than sixty kinds of living organisms, taken from an average depth of four and a half kilometres. At the entrance to Ice Fjord in Spitzbergen, the Prince of Monaco netted in a single haul 1775 shrimps (*Pandalus borealis*), weighing altogether nearly twenty kilogrammes. But the sea is everywhere full of life. The cruises of the *Michael Sars* have shown that in the middle of the ocean, where the number of living organisms is less than off the coasts, the plants and animals constituting the microscopic plankton can be estimated at 3000 to 12,000 per litre of water. On board the *Michael Sars*, a single cast of the net brought up 330 fish from a depth of 1000 metres, off the west coast of Ireland. Finally, at a depth of 7000 metres, where the light and heat of the sun can never penetrate, living things are still to be found.

These truths are so evident that it is impossible to deny them. Therefore we are forced to admit that life is profusely distributed, and that, wherever it can exist, there it appears and remains.

The following few observations will also show—although this demonstration may be hardly necessary—not only that every living thing endeavours with all its strength, by the very fact that it is alive, to continue to live—that it is constantly making the utmost effort, whether consciously or no, to persevere in its existence—but also that there is no sacrifice it will shrink from in order to ensure the perpetuation of its species.

The following is a very condensed review of the means employed by Nature to achieve these two objects: the preservation and the diffusion of life.

Let us take the case of plants. In order to protect themselves against their enemies, they resort to a number of devices: prickly hairs to prevent insects from climbing up the stalk; also, in many cases, acid or bitter juices secreted from the leaves and the stem which may serve to keep off hungry visitors. Sometimes, as in the nettle, the acid is collected in the tip of stiff hairs, so that any aggressor, be he man or beast, has to smart for his imprudence.

Another method, which we see adopted by the viscous *Lychnis*, is to cover the stem with a gummy substance, which forms an effective obstacle to insects in their ascent towards the flower, the seeds, or the leaves.

Thorns and prickles, in many cases, safeguard a plant against attack, and to a certain extent these also can be considered as a means of protection.

The most curious expedient of all is undoubtedly the one adopted by the sensitive plant, which at the slightest touch makes its leaves contract in the way familiar to us all. Any ant or beetle that happens to climb up the stalk is stopped as soon as it gets near one of the leaves by a mechanical device set in motion by the insect itself as it crawls over a tiny spikelet growing at the very base of each petiole. This spikelet rests on a little cushion full of water. The least pressure causes it to act as a lever, squeezing the cushion and forcing some of its water up into the stalk. The petiole, being no longer supported by its cushion, subsides a little; the leaves close, and this movement drives away the intruder.

But plants do not always find these protective methods sufficient to secure continuity of life. Hence they fall back as a rule on another process of great efficacy which we shall speak of in a moment: the rapid healing of wounds.

It is the aim of plants, as of all living things, to ensure the perpetuation of their species. To that end, not only is the number of seeds produced something prodigious,¹ but every plant actually does all that lies in its power in order that its seeds may germinate.

For instance, if the seeds were to fall in a mass at the foot of the mother-plant, they would stifle one another, and moreover, except in the case of annuals, the mother's own shade would hinder the proper development of her children. It is necessary

¹ To take two examples at random: *digitalis* bears 120,000 seeds, *sisymbrium* 75,000 seeds in a single season. The seeds that do not germinate are not lost; they serve as food for vast numbers of birds and insects, or else they fertilise the soil by their decomposition. Here again we have life springing up out of death.

therefore that the latter should seek their fortunes at a distance. Several methods, all showing remarkable intelligence, are employed to bring about this desirable result.

(a) Often the seeds have little wings or parachutes, so that the wind can easily carry them away. This is the case with the dandelion, lime tree, sycamore, hornbeam, maple, elm, ash, maritime pine, willow, cotton shrub, etc.

(b) Or else the seeds are closely connected with the fruit on which animals and birds feed. But each grain of seed is contained in an envelope hard enough to resist the gastric juices, and in course of time it is deposited on the ground in the natural way along with a small provision of manure. This applies to the strawberry, raspberry, mulberry, grape, fig, arbutus, sloe, beam-berry, black currant, red currant, sorb, hawthorn-berry, elder-berry, etc.

(c) In other cases, the pod bursts, and the seeds are scattered about, as with balsam, wild cucumber, lupin, box, broom, etc.

(d) Sometimes the seeds are provided with small hooks which catch in the hairy coats or fleece of quadrupeds, who thus act as involuntary carriers and distributors: burr, herb-bennet, goose-grass, etc.

Plants are indeed forced to take all these precautions. Their seeds are attacked by so many enemies, are surrounded by so many agents of destruction, that without this fecundity and these stratagems the race would soon disappear.

What happens in the case of fishes? We notice that their spawn is extraordinarily abundant, and for the same reason. For instance, the herring produces between 20,000 and 60,000 eggs, the pike 100,000, the sole between 500,000 and 800,000,

the sturgeon more than a million, the cod from 3 to 7 millions, the conger-eel from 8 to 9 millions, the turbot 15 millions, the ling from 20 to 28 millions.

As for insects, one hyphantria can be the mother of 125,000 caterpillars in a single season. Huxley tells us that a single green-fly (aphis) will produce parthenogenetically, in ten generations, a trillion individuals. A queen bee, at the height of her productivity, will lay during the season between 2000 and 3000 eggs a day, or close upon a million altogether in her lifetime.

For the seeds of plants, the eggs of insects, or the young of animals, the rule holds good that the greater the mortality likely to be incurred by them, the larger the numbers that will be produced.

It is necessary, indeed, if a species is not to become extinct, for the young ones to be either extremely numerous or very well looked after by their parents. Nature seems, therefore, to have endowed the parents just mentioned with prodigious fertility in order to make up for their inaptitude, through lack of knowledge or lack of power, to protect their offspring. This is a universal rule. The common partridge, for example, lays from ten to twenty eggs, whereas the eagle, whose young run no great risks, generally lays only two. The exceptions are more apparent than real. Thus, the lioness has a larger litter than the zebra or the antelope, which serve as food for her and her kind. Nevertheless, there are indisputably fewer lions than zebras. That arises from the fact that, from some cause yet unknown, a very high mortality obtains among young carnivora. To prevent carnivora from dying out, therefore, the number of births must be relatively large. Thus Nature in

many cases has to be prodigal of life in order to secure its continuity. This prodigality is not waste.¹

The objection has been made that this extraordinary fecundity of plants and the lower animals could not be otherwise than it is, seeing that only those individuals which had acquired this characteristic by some means or other would be in a position to perpetuate their species, while the others disappeared automatically, so to speak; and that consequently we may regard this phenomenon as being due to a purely fortuitous cause. To us it appears, on the contrary, that the struggle for existence, so terrible at first sight, was expressly resorted to by Nature in her constant desire for more life, in order that the privilege of perpetuating their species might fall to those, and those alone, who were best qualified for it in point of tenacity, endurance, fertility, and (at a later stage) intelligence. The others were only Nature's experiments; for, always aiming at something better, she made many preliminary rough models that she destroyed, many tentative moulds that she broke up again before being satisfied with her handiwork, that is, before obtaining the maximum of life that circumstances and environment would permit.

With the same object in view, lower beings, such as plants, insects, etc., which are constantly exposed to numerous dangers that they cannot always avoid, heal their wounds with extraordinary celerity,

¹ We shall not accuse Nature of being wasteful if we reflect that, ever since our Earth has been what it is, that is to say, for millions of years, an incalculable number of beings and things has been produced out of the same atoms or electrons, in an infinite variety of combinations. Nature, then, is not wasteful, since she makes eternal use of the same substance without ever destroying it.

and have seldom any difficulty in renewing parts of their body that have been destroyed.

The lawn under our feet that is subjected to the mowing machine untiringly resumes its verdant growth after each operation, every blade of grass showing the same eagerness to live the fullest possible life.

Cuttings taken from the parent stem and stuck in the earth develop roots and leaves, flowers and fruits and seeds. What a miracle of regeneration is this! What a tremendous task to have accomplished!

Likewise, we see branches of trees and shrubs that have been ruthlessly cut away putting forth again.

One might even say that serious injuries or the danger of death stimulate the development of plants. It seems as though a plant on the point of death makes desperate efforts to ensure the transmission of the life which animates it. We will only give three examples borrowed in a condensed form from H. de Varigny:—(a) In 1830, when the French landed at Sidi Ferruch, there were quantities of agaves in the neighbourhood of Algiers. It was decided to establish a camp in the midst of them. The soldiers amused themselves throughout the winter by probing the unfortunate trees with the points of their sabres and bayonets. The result was that in 1832 all the agaves flowered in March. There were at least 1500 of them, and not one failed to produce its blossoms. (b) On the 2nd September, 1903, a serious fire broke out in the village of La Chaussée-sur-Marne, destroying part of it. Driven by the wind, the flames reached the confines of the village, and also attacked a neighbouring orchard of pear and apple trees. The first five rows of trees

were almost entirely destroyed. In the sixth row the damage was not so complete, but, nevertheless, a great number of branches were singed. On the uninjured branches a peculiar phenomenon was observed: a second flowering took place, beginning about the end of September, and in October all the branches that were not too much damaged were covered with blossoms just as in May. That is not all. In another direction the fire stopped in close proximity to some lilac trees, and these, as well as a few plum trees, flowered for the second time. (c) A similar fact was communicated to the Biological Society, very soon after the preceding episode, by M. Apert, who saw in the south of France lilac trees beginning to blossom in October, after they had in July and August been devastated by the Spanish fly (*cantharides*). The trees that had been most damaged were those which bore the thickest foliage and the finest flowers.

If we pass from the vegetable to the animal kingdom, we notice in inferior animals the same power of regeneration. One may say that, as a rule, the greater the risk of injury to a limb the more it is formed with a view to its easy reproduction. Examples: the feelers of starfish, the claws of lobsters and crabs, the legs of spiders, the tactile horns of snails and slugs, the tails of lizards and slow-worms, and the fins of fishes.

The claws of the large common crab, the rock lobster, etc., fall off when gripped by an enemy. This is done by the animal itself, which is able to break off its own claw by contracting a particular muscle (the long extensor muscle of the second joint). The self-amputated crab does not die of hæmorrhage; there is no bleeding at all, the wound being hermetically closed at once by a special

membrane. Another object of this instantaneous closing is to prevent microbes from penetrating into the system.

A still more remarkable fact has to be mentioned : not only does the lobster find it easy to sacrifice a claw when the necessity arises, preferring to save its life at the cost of a limb, but the act of mutilation brings into play a whole system of nerves and muscles, so that the claw holds on to the enemy with unabated vigour, and while the latter is endeavouring to get rid of the encumbrance the lobster escapes with its life.

A somewhat similar phenomenon is presented by the lizard's tail, which is also easily detached from the body ; instead of lying still, however, it attracts the enemy's attention by wriggling about, and in the meantime the lizard whisks out of sight with its accustomed rapidity.

Very soon a new claw, or a new tail, as the case may be, grows in the place of the old, ready to be sacrificed in its turn when life depends on it.

In some kinds of animals one can see a regeneration even more important and complete. Everybody knows that if an earth-worm is cut into two nearly similar parts, one of the two fragments will develop a head with its special organs, and the other a tail with all that belongs to it.

If a turbellarian (a kind of flat-worm) is cut into twelve pieces, in a short time each of the pieces will become a new and complete individual of the same species. You can chop up a single *naïs* (the name of a transparent worm found in river-grass) into more than thirty pieces, and get as many perfect worms out of it.

Spallanzani, when experimenting on salamanders, saw the four legs with their bones, ninety-eight in

all, as well as the tail with its vertebræ, reproduced six times in the space of three months ; in others he saw the lower jaw formed a second time with all its muscles, blood-vessels, and teeth.

We may notice that the healing power manifested in the regeneration of a broken or injured part appears to be greater or smaller according as the life of the animal is more or less dependent on that part of the body : worms renew their heads before their tails ; and in fishes, the fins that are lost are reproduced in the order of their importance, first the caudal, next the pectoral, then the ventral, and finally the dorsal fins.

Other examples could be given, but the above will suffice to call attention to the important part played by this regenerative faculty.

Lobsters and spiders are subject at any moment to lose their claws or legs, snails and slugs their tactile horns, lizards their tails, plants their leaves and branches ; none of these being sufficiently intelligent or strong to preserve themselves from such accidents. Nature has therefore strongly developed in them this healing power which permits them to continue to live in spite of the dangers to which they are exposed.¹

We must notice, however, that this power diminishes in force as we ascend the scale of animal species. This is because the intelligence or strength of the animal enables it to avoid the dangers to which inferior animals would succumb were it not for this marvellous gift. With superior animals this power of regeneration does not extend to the rebuilding of an entire limb. Nevertheless, after

¹ This recuperative power is also observable in crystals. A crystal with a corner broken off, or otherwise damaged, will succeed in repairing the injury if immersed in some nutritive fluid.

the removal of a third, or as much as a half, of the important gland we call the liver, that organ is capable of a new growth which will restore it to its original size and weight.

A limb that has been paralysed through the severing of a nerve will often regain the power of movement after a certain length of time. A number of tiny fibres grow towards each other from the ends of the severed nerve, and directly two of them meet they unite and increase in thickness, while the others, being of no further use, disappear. The nerve having been repaired in this fashion and communication re-established, movement is once more possible.

We know, too, that skin grows again when it has been torn, that severed muscles and broken bones reunite, and that flesh wounds, though deep, will heal over. And finally, the old and enfeebled cells in all parts of the body are constantly being replaced by young and vigorous ones. This is an important fact.

* * *

A living being is not only surrounded by visible enemies (the "devourers," which also wish to live), but he is also attacked by invisible foes: the microbes of disease. He struggles consciously against his visible enemies, but the war against pathogenetic bacteria is carried on without his knowledge. Among superior animals, man, for example, we know the important function which the ordinary living cells, especially the phagocytes, perform in the contest with disease.¹ Phagocytes never rest; they destroy cells that, being worn out, are an encumbrance and a danger. They

¹ Blood in its normal state contains one white corpuscle (phagocyte or leucocyte) to every 500 or 800 red corpuscles.

remove from the circulation the old red corpuscles that have become useless, they form a protective barrier round inflamed parts, and contribute to the healing of external wounds. Finally, guided by their chemotactic sensibility,¹ the mobile phagocytes rush towards the place that is invaded by pathogenetic² bacteria, and—in a healthy man and under normal conditions—they courageously attack the microbes, absorb them into their own substance, kill them, and make them disappear by a process of digestion.

Or, again, they manufacture, jointly with the serum, certain antitoxins which are destined to neutralise the poisons resulting from the vital activity of the invaders. (The excreta and some of the chemical compounds derived from the physiological functions of animals and plants are poisonous to their producer, which is the reason why they are thrown off. Thus, man, for example, produces oxide of carbon, sulphuretted hydrogen, organic poisons, urea, etc. Now, the excreta of certain microbes are poisonous to man, whence the necessity of neutralising them by means of antitoxins. This is what is done by phagocytes.) In one way or another, then, and without ever tiring of their task, our phagocytes put forth all their energy for the protection of the body. Thus, until a wound is completely healed, innumerable white corpuscles remain close to the spot, where they are continually engaged not only in putting hostile

¹ A peculiar sensitive faculty which enables phagocytes to recognise the chemical constituents of foreign bodies that enter the system.

² Microbes in their relation to man can be divided into three main classes: the pathogenetic (those that set up disease), the beneficent (*e.g.* those that probably help in the processes of digestion), and the neutral (which are by far the most numerous).

microbes out of the way, but also in removing dead tissue and worn-out cells, their object being thoroughly to cleanse and purify the field of battle. In certain cases, as, for instance, an abscess, the fierceness of the struggle is patent to the eye. For the pus is largely composed of phagocytes that have been slain in the fight, and are then, for sanitary reasons, eliminated from the system.

These phagocytes of ours are also frequently in the habit of "mobilising," that is to say, they increase very rapidly in number whenever the hostile microbes themselves are multiplying fast. Take a single example: in pneumonia, their numbers rise from the normal figure of 7000 per cubic millimetre of blood to 20,000. This highly active production of new white corpuscles takes place more especially in our ganglia and in the marrow of our bones.

We shall better appreciate the usefulness of the phagocytes if we remember that they have to fight the bacteria of as many as thirty infectious diseases. And, what is truly wonderful, these battles go on automatically without our being conscious of them; our phagocytes sacrifice themselves for the general welfare, and we know nothing of it.

Not only the white corpuscles, however, but all our organs, all parts of the body, fight against disease.

It is no exaggeration to say that our body, both as a whole and in each of its parts, is perpetually on the *qui vive*. Observation will show that each of our bodily organs is, indeed, constantly exerting itself to the full in order to protect the whole system and to keep it in good working order.

Let us take as an example the glands and their various functions.

The liver converts certain highly poisonous ammoniac salts into urea, which is eliminated from

the body ; it transforms or neutralises most other poisons (thus, it reduces by half the toxic effects of nicotine) ; it stops metallic salts on their way, and proceeds to eliminate them very slowly, in such tiny quantities that they will not endanger the system. Moreover, it fights against the microbes which produce malignant carbuncles, the staphylococcus, and the bacilli of cholera, dysentery, and typhoid fever. The liver also manufactures red corpuscles, accumulates reserves of iron, and stores up sugar. It plays an important part in digestion by its action on albuminoids and fat. Lastly, it secretes from 1200 to 1300 grammes of bile a day. (Bile turns fatty substances into an emulsion, prevents intestinal fermentation, and by promoting peristaltic contraction helps in the evacuation of the bowels.)

The spleen acts as a storehouse for iron, forms red and white corpuscles, and through the latter helps to protect the system against all sorts of infection. Violent emotions cause the spleen to produce certain secretions which strengthen the muscles and also render them less sensitive to pain. Thanks to these secretions, then, the body is automatically brought into the most favourable condition either for defence or for attack.

The thyroid gland acts as a regulator of the processes of nutrition as well as of the temperature of the body. It is also of capital importance for the proper working of the brain, in that it prevents poisoning of the central nervous system.

The pituitary gland helps to co-ordinate the movements of the body. It increases the strength of our muscles, influences the development of our bony structure, and promotes cerebral circulation and nutrition.

The pancreas produces a digestive juice which plays the principal part in breaking up carbohydrates, fats, and albuminoids. It also regulates the consumption of sugar in the body.

The kidney, or rather kidneys, filter the substances contained in the blood, keeping back a sufficient quantity of what is necessary, and eliminating all waste matter, poisons, and other superfluous substances.

The appendix helps in the contractions of the cæcum and the large intestine, and thus facilitates evacuations.

The thymus is an organ which is essential to the growth of the bony framework of the body, and plays an important part in the nutritive functions during childhood. Being of no further service in the adult, it disappears.

The five million microscopic glands, which in twenty-four hours pour out 6.5 kilogrammes of gastric juice on our food.

The sweat-glands, which enable the body to endure excessive heat, and which are continually throwing off poisons of various kinds in the form of visible or invisible perspiration.

The sebaceous glands, the secretion of which prevents the skin from becoming dry and keeps it supple.

To this far from exhaustive list ¹ we may add three sets of glands which, though most useful, are of secondary importance.

The glands surrounding the duct of the outer

¹ Readers who are desirous of extending their knowledge of the various functions of the glands and the bodily organs in general, without being troubled by too many technical terms, may consult *Les merveilles du corps humain*, a popular treatise by Doctors L. and P. Murat. These writers enumerate fifty distinct functions of the liver.

ear which ends in the tympanum, an extremely delicate membrane. The slightest trace of dust makes these glands contract and pour a bitter, sticky fluid over the intruding body, in order to hinder its further progress.

The lachrymal glands providing the liquid with which the eyelids wash the cornea, so that the vision may always be kept clear.

The glands situated behind the eyelashes, which exude a greasy liquid to ease the sliding movement of the lids, thus guarding against the discomfort and local irritation that the friction would otherwise set up.

Later on we shall speak of the heart, the lungs, the skin, etc. But meanwhile the facts enumerated above are sufficient to make it clear, even at this stage, that every part of the human system does yeoman service, as we have said, for the protection as well as for the even working of the whole, and that, for the most part, while we are unconscious of what is going on. This incidentally accounts for the frequency of what may be called spontaneous recoveries. It happens now and then that we are distinctly conscious of not feeling well, of being "off colour." Yet, the next day, without having taken any drug, we find ourselves all right again. That is such a common experience that we do not even notice this extraordinary recuperative power that our body possesses.

In more serious cases, when the doctor is prescribing mild remedies of no great efficacy, because he is not yet certain what is wrong, a few days' rest will often suffice to dispel the trouble; our organs have been able to do by themselves all that was necessary.

Bear in mind, too, that cases of epidemic disease

in which the system cures itself are far more numerous than those that require medicine. In a cholera epidemic, for example, if statistics could be taken of those cases that ended fatally and of those others in which some intestinal disturbance was followed by spontaneous recovery, a ratio would be found to exist of several hundred "natural" cures to each death.

It is also a fact that, in something like eighty cases out of a hundred, the autopsy of persons killed in accidents or by diseases other than tuberculosis reveals the existence of pulmonary lesions perfectly healed. Such individuals must have been consumptive during a certain period of their lives, and probably without knowing it, the disease having been transient and the recovery spontaneous.

* * *

Why these desperate battles, these unceasing struggles against the forces of death and destruction? Why this wonderful unity and harmonious co-operation between all our organs? Because a persistent tendency to live is the essential law of all existence, not only among men, but among all living creatures. The being that has received the gift of life wishes to go on living. This desire manifests itself in all the grades of creation, in all beings at every stage of development.

Again, life might disappear if living beings could not adapt themselves to new circumstances when their surroundings change, but were always obliged to remain in their original likeness. Nature has foreseen that, and has endowed all living creatures with a wonderful power of adaptation. Let us take a few examples.

We know that water is indispensable to life,

because numerous vital functions can only be performed if plants or animals contain a certain minimum of liquid. Therefore it is evident that, under penalty of ceasing to exist, the flora of the desert has been obliged to modify its primitive habits in order to adapt itself to the almost permanent drought of its habitat. This problem was difficult to solve, yet plants have solved it successfully. They have even found several different means of attaining their end, of which the following six are the most common :—

(a) The leaves which by their respiration cause the water to evaporate are reduced to the strict minimum, being small and few in number. In some plants the leaves have even disappeared altogether, and the stem suffices for the respiratory functions.

(b) Plants use the short rainy season in which to do all their work—to grow, blossom, and ripen their seeds, which will be able to wait without danger till the next season,—and then they wither and die.

(c) Roots spread prodigiously, sometimes laterally to a distance of fifteen to twenty yards, in order to absorb the rain-water before it evaporates ; sometimes vertically downwards, in order to seek in the depths of the soil the water without which they cannot live. Roots may attain to twenty times the height of the plant above the ground.

(d) Plants develop on their surface glands for secreting salts that absorb the humidity of the air.

(e) They store, either in their roots or in their stems and leaves, the greatest possible quantity of water during the rainy season, and, moreover, prevent its evaporation in many different

ways in order to make their provision of water last the whole of the dry season.

(f) They prevent the soil from losing its moisture through evaporation caused by the heat of the sun and the action of the wind, by covering the ground closely and in thick layers with their leaves and stems. (For more details see *La Nature et la Vie*, by H. de Varigny.)

Very clever means of adaptation are found also among aquatic plants. Moisture being injurious to pollen, they have recourse to numerous expedients (for here, too, there is great diversity in the methods employed) in order to preserve their pollen from contact with the water. These are some examples :—

(a) In the *Vallisneria*, the female flowers have a very long, corkscrew-shaped stalk which when stretched out brings the flower above the water. At a particular moment, the male flowers break the bonds that keep them down, and, by means of an air-bubble in the encasing envelope, rise quickly to the surface. Here they open out and set free the pollen which fertilises the female flowers. The latter then contract their spiral stalks and sink back to the bottom, where the fruit is developed.

(b) The *Utricularia* follow a different plan. Their roots are provided with a number of vesicles which are closed by a kind of movable cover. These vesicles are filled with a mucus of such density as to keep the plant at the bottom of the water. But at the favourable moment this gives place to certain gases, the lightness of which enables the plant to come up and flower at the surface. Subsequently, owing to fresh mucus produced by the root, the plant sinks once more to the bottom.

(c) The water-chestnut has adopted a very

similar method. It lives at the bottom of the water until the season of fertilisation, when the petioles become inflated and bring the plant to the surface. The flowering takes place in the open air, after which the petioles fill with water again, and the plant sinks back to ripen its seeds.

(*d*) The varec is fastened to the bottom of the sea, and its flowers are wrapped up in its leaves. Though the leaves are open at one end, the flowers are prevented from getting wet by giving off gases which resist the pressure of the water, so that not a drop can penetrate within.

(*e*) Most of the other aquatic plants are lazier or less intelligent, being content to wait until their stalks have reached the surface of the water before they flower.

Mention of the varec tempts us to say a few words more on the subject of marine plants. Sunlight is broken up by sea-water into seven colours, just as when passing through a prism. The red rays, which are stopped first, do not go deeper than 30 metres. Inasmuch as these rays are essential to algæ, as to all green plants, for the formation of chlorophyll, most of this family do not flourish at a greater depth than 30 metres. There are certain algæ, however, more energetic than the rest, which employ a very ingenious device for increasing the depth at which they are able to live. They secrete a red pigment which is spread over the layer of chlorophyll, and thus transforms the blue rays from the sun, which penetrate 200 metres below the surface, into the red light that is indispensable to them. That is the depth, then, to which these green algæ have extended their domain, namely, 170 metres lower than the depth accessible to their less enterprising brethren.

Climbing plants, too, are of great interest from the point of view of adaptation. Their stalks being unable to support themselves, unaided, in a vertical position, these plants have also invented several ingenious ways of circumventing the difficulty.

(a) In some cases the stem twines itself round the supporting body—hop, bindweed, etc.

(b) Others, of which the vine is the typical example, have developed true prehensile organs, that is to say, tendrils of a peculiar sensitiveness which makes them aware of the presence of a prop for them to encircle. If we watch a vine stalk, we shall see a number of outstretched tendrils feeling about in the void. Their tips slowly describe a circle which is completed within an hour or thereabouts. When the tendril has succeeded in finding an object to attach itself to, it throws its ends round it like a ring, and an hour later it is clinging so tightly that it cannot be torn away without difficulty.

(c) The nasturtium, clematis, etc., manage to do without tendrils; they content themselves with imparting similar sensitiveness to the petioles of their leaves, and fasten themselves by means of these.

(d) Ivy provides all its offshoots from end to end with clinging roots which might be compared to grappling-hooks.

(e) The Japanese vine fixes itself more firmly still by exuding from the extremities of its smaller sprays a drop of cement so strongly adhesive that it is necessary to tear the spray itself in order to loosen its hold. This cement, which is manufactured for this special purpose, appears only at the proper place and at the right moment, that is,

when the tip of the spray comes in contact with something to support it.

Every autumn we witness an adaptive expedient which is resorted to by trees in order that they may live through the cold season without injury. Low temperature impedes the vital functions of a tree, and causes the roots to send an ever-diminishing quantity of nourishment to the branches and the leaves. Were the leaves to remain, the resultant evaporation would quickly exhaust the store of moisture contained in the tree, and death would ensue. How does the tree adapt itself to these new conditions? Simply by getting rid of its leaves, a surgical operation intelligently performed. For, long before the fall of the leaf, there is formed at the point of junction between the branch and the petiole an exceedingly fine layer of material somewhat resembling cork, which gradually blocks the passage of the sap, and which, when the leaf has fallen, hermetically closes up the opening, so that neither a single drop of sap can escape nor any microscopic foe make its way in.

(This surgical operation recalls that performed by the lobster. He breaks off his claw for the same reason that the tree sacrifices all its leaves—in order to save its life; and in each case the wound heals immediately so as to prevent the outflow of nutritive fluid and the entry of pathogenetic microbes.)

Less heroic measures are adopted by evergreen trees and shrubs living in cold or temperate climates. Their leaves present a hard and, as it were, glazed surface which makes the process of evaporation slower; moreover, their stomata (tiny apertures in the leaf through which water evaporates) are closed during the winter. Lastly, the majority of

evergreens have, in addition, reduced the surface of their leaves, and consequently the area of transpiration, to a minimum by making them more or less needle-shaped. This is the case, for example, with the pine, the fir, the yew, the cypress, etc.

It should be noted, however, that in warm and damp climates the shedding of the leaf, being unnecessary, does not occur. Thus it is that trees which in cold or temperate regions strip themselves of their leaves every autumn, become evergreen when they are transported to a damp, hot country. In Réunion, for instance, peach trees raised from European seedlings continue to shed their leaves every winter when they are planted in the interior of the island, whereas those that are placed on the sea-coast, which is warmer and damper, have ceased to shed them, or nearly so, by the end of twenty years; and their descendants inherit this tendency, which becomes more and more pronounced as the generations go by, so that in course of time there is complete adaptation to the new climate.

Here is another example of adaptation, to be found at our very feet. If, as is done in England, lawns are closely mown with a mowing-machine once a week, from May to September, one may notice that the different plants which grow in the turf—daisies, dandelions, fennel, buttercups, clover, etc.—manage to blossom, although they are often mutilated, and by shortening their stems try to enable their flowers to escape the mowing machine.

The grasses of which these lawns are composed cannot do this, since their flowers, unlike those of the daisies, etc., do not appear at the end of the stalk, but all along it. Determined, however, at all costs to prevent the race from dying out, they

throw out young shoots in every direction with an energy that is only enhanced by the frequency of their mutilation, so that the oftener lawns are mown, the finer and more velvety they become.

If we pass from plants to insects or crustacea that inhabit dark caverns, we see a transformation of a no less ingenious kind. Here it is not a case of evading the mowing-machine, of economising water, or of keeping pollen dry, but of adaptation to the absence of light. These cave-dwellers have simply suppressed the organ of sight as being no longer of any use, while on the other hand they have increased as much as possible the length of all their appendages: claws, antennæ, and tails, which are sometimes three or four times as long as the body, somewhat after the fashion of blind men, who add to the length of their arms by holding a stick. This permits them to become rapidly aware of the presence and shape of the obstacles they encounter, and, what is still more important, of the presence of their prey. Nature wishes life to exist everywhere, even in the darkest and most silent places. The cave-dwelling animals, therefore, have adapted themselves to an environment for which they were not originally intended.

(Since 1896 a laboratory has existed in the catacombs of Paris, in which these changes may be observed.)

The same thing happens in the depths of the sea. Many fishes, that live so far from the surface as to be in complete darkness, have imitated the insects and crustacea we have been speaking about, and a multitude of marine animals are found in the ocean whose antennæ, feelers, and fin processes have been lengthened to an extraordinary degree in order to make up for their lack of vision. Certain

kinds of prawn, for instance, have antennæ which are five or six times as long as their body.

There are other animals, however, which have refused to become blind. All inhabitants of great ocean-depths that possess eyes are also furnished with luminous organs capable of emitting rays of sufficient power to light up their path. As an example, we may point to the halosauropsis, living at a depth of 1500 metres, which is just an ordinary long-shaped fish like the whiting in appearance, but which has two rows of apertures on each side of its body, regular "port-holes" containing a phosphorescent substance; these are beacons or projectors which it employs to light up its path, and also, perhaps, during the mating season, for the purpose of sexual attraction or recognition.

But it is not enough that it should make its own light: it must have the power of concealing its presence, in an emergency, from dangerous and inquisitive foes. Nature, with her customary foresight, has provided the requisite mechanism to that end. Each of the little lamps is fitted with a kind of valve or lid which the fish can raise or lower at will, thus revealing or hiding the source of the light it carries.

Other inhabitants of the submarine world are able to emit light of various colours, by means of special organs called chromatophores.

On board the Prince of Monaco's yacht, between the Azores and the Canaries, Dr Joubin had the opportunity of admiring a large cephalopod which was sending out streams of vivid blue, green, and red light; on the animal taking alarm, this was abruptly cut off, as by the turning of a switch.

Most of these luminous organs are marvellously

constructed, after the fashion of a bicycle lamp or the head-lights of a motor car. The phosphorescent substance, whence the light is derived, is situated between a cavity, lined with a shiny membrane that acts as a reflector, and a lens, analogous to the crystalline lens of the eye, which is intended to project the rays of light in front. And, in addition to this, there are glands at the animal's disposal containing liquids of different colours, by means of which, when thrown in front of the projecting lens, it is able to tint the light that it pours forth.

Thousands upon thousands of marine animals are provided with these organs. Indeed, out of 1007 different species of fishes living in the great ocean depths, no fewer than 112 (or a ninth of the total number) are known to be equipped with phosphorescent plates. (See on this subject the splendid researches of Dr Joubin, professor at the Institut Océanographique.)

What is the nature of this light? Is the phenomenon one of simple phosphorescence? Does it originate in electricity, or is the cause to be sought for amongst the mysterious phenomena of radio-activity?

The study of the subject, so far, has furnished no answer to this question. It was shown, however, by Professor Chun, in the course of the *Valdivia* expedition, that these luminous inhabitants of the great depths could be photographed in the midst of their activity, their own light acting on the sensitive plate.

Here is another case of adaptation, which we mention because it is rather curious. In the inner compartments of salt-ponds (*marais salants*), where salt is obtained by evaporation, a small crustacean,

the *Artemia salina*, is found, which has thoroughly adapted itself to living in water that has almost reached the point of saline saturation, and cannot live elsewhere, although this environment is to some extent artificial. This crustacean, then, is only met with in salt-ponds, in spite of its close affinity to the Branchiopoda, which can only live in fresh water.

Lastly, we may add that soles, turbot, etc., in order to make themselves invisible, especially when young and exposed to the attacks of many enemies, can easily assimilate the colour of their body to that of the ground over which they happen to be. This is done by opening or contracting different cells in the skin containing pigments of various hues.

An instance of rapid adaptation to environment may be found in our own bodies. When we remove from a lower altitude to a higher, we have to fight against the increased rarefaction of the atmosphere, or in other words against the dearth of oxygen. The method of adaptation employed by the system consists in extending the respiratory surface of the blood, by augmenting the number of red corpuscles (which store up oxygen). For example, at Zurich (412 metres above sea-level) the number of red corpuscles per cubic millimetre is 5,752,000; at Davos (1600 metres), it is 6,551,000; at Arosa (1800 metres), 7,000,000; and in the Cordillera of the Andes (4932 metres), 8,000,000. On going down into the plain again, the number of red corpuscles reverts to the normal.

Altogether, it has been well said that in Nature all is adaptation: the peculiar formation of web-footed birds, the long legs and bill of the waders, the oil-glands of water-fowl and sea-birds which

prevent their feathers from getting wet, the whole structure of the dromedary and the camel as adapted for life in the desert, the swimming-bladder which enables fishes to poise themselves in the water at different depths, the horizontal movement made by the jaws of herbivorous animals, the shape of the teeth in carnivora, herbivora, and rodents respectively, of the beak in granivora, insectivora, and birds of prey, of the limbs in jumpers (such as the kangaroo) and climbers, in quadrupeds and bipeds, and so on almost indefinitely.

* * *

A very interesting case of mental adaptation may be observed also in man—convincing proof of which has been given by the Association for Promoting the General Welfare of the Blind. This Association, after a long inquiry, declares that blind people are almost unanimous in saying that “their deprivation of sight does not distress them in the least, and that they scarcely spare a thought to the circumstance”; but that the poverty, on the other hand, which often accompanies loss of sight causes them much anxiety. Consequently, they do not want people to waste their pity on an infirmity to which they have adapted themselves; they only want to be taught how to earn their bread.

The few instances of adaptation that we have given are enough to show that living creatures, in order to continue as such, are always ready, in a general way, to make the very best of such conditions as are imposed on them by chance or by environment.

* * *

After speaking of adaptation, it is only proper also to point out the wonderful constancy of the

vital element in man, whenever such constancy is either necessary or favourable to life.

The first animal cell—a marine organism—made its appearance in the pre-Cambrian period. The water of the oceans in which it was bathed probably contained saline matter in the proportion of 8 grammes to 1000.¹ Now, after an incalculable lapse of time, and at the other end of the chain, we find that the blood cells of the human body float in a lymphatic plasma the chemical composition of which is exactly similar to the sea-water of the pre-Cambrian period. The amount of sea-salt in the blood is still between seven and eight parts per thousand. This ratio will remain constant whether a man leaves off taking salt with his food or undergoes a strict fast or puts himself on an excessively salt diet. In the first and second cases, the kidneys will stop all elimination of salt, while in the third case they will get rid of it as fast as possible. But if the renal filter should happen to be working badly and an excess of salt were retained in the body, water would at once be kept back also, in sufficient quantity to dissolve the salt in the blood and to bring it back to the figure indicated. This extra water will be stored away in the loose tissues of the legs, ankles, etc., and cause swelling—a dropsical affection which will disappear of itself if the patient is deprived of salt for some time.

Whatever we do, then, it is impossible for us to change this ratio of seven or eight to a thousand, and we may say with Quinon that “animal life, which appeared as a cell in seas of a particular degree of salinity, has tended to maintain this original proportion throughout the whole series of zoological evolution.”

¹ The proportion is now 33 grammes, on an average.

A fact that adds to our surprise is that the blood of mammalia—the creatures which have travelled furthest from their marine origin—contains not only the above-mentioned proportion of common salt (chloride of sodium), but also all the other substances which are found in sea-water; and, moreover, they occur in the same relative order of importance in our blood as in the ocean: (1) chloride of sodium; (2) potassium, calcium, magnesium, sulphur; (3) silicium, carbon, phosphorus, fluor, iron, nitrogen; lastly, in infinitesimal quantities: iodine, bromium, manganese, copper, lead, zinc, lithium, silver, arsenic, borium, barium, and aluminium.

The reason for this constancy is evident. The living cell appeared in the ocean at the moment when the chemical constitution of sea-water was most favourable to life. But that which was favourable to the life of the cell millions of years ago is still favourable to it at the present day. That explains the special care with which Nature has perpetuated for the cell's behoof a fluid which constitutes the best life-preserving medium, that is, one in which the cell can live and flourish.

* * *

Quite as remarkable is Nature's constancy in the matter of body-heat.

We know that the internal temperature of the human body must, under pain of death, oscillate only between a few degrees (centigrade) above and a few degrees below the normal temperature. Yet we are exposed to much greater extremes of heat and cold, to which the body has been obliged to accommodate itself. How did it solve this problem of keeping the blood at the same degree of heat

whatever might be the surrounding temperature? In order to resist excessive heat it developed sudoriferous glands, which work all the more actively in proportion as the temperature is raised. The hotter the air is, the more the body perspires; the perspiration, evaporating, cools the body, and thus the internal temperature is kept within the limits that are compatible with life. If, on the contrary, the temperature is too low, there is automatic periph-
eric vaso-constriction, in order to prevent the blood from cooling itself at the surface, and then an increase in the intensity of molecular exchanges (that is to say, internal combustion), which leads to the production of warmth.

Shivering also warms us, by means of a series of short but rapidly repeated muscular movements. And sometimes, in addition to these slight tremblings, Nature has recourse to a spasm of a much more violent kind, the sneeze, which serves the same purpose as shivering.

Another circumstance which may well cause us to wonder is the extreme sensitiveness of our heat-regulating apparatus. The internal temperature of a normal man varies only by nine-tenths of a degree in the twenty-four hours. At 12 noon it is 37.1° (centigrade); it rises until 4 o'clock, when it attains its maximum of 37.3° ; at 8 p.m. it has fallen again to 37° ; at 12 midnight it is only 36.5° , and finally falls as low as 36.4° between 3 and 4 in the morning.

* * *

It has sometimes been said that Nature need not have invented all this complicated apparatus, if she had been content to produce only cold-blooded animals whose life becomes more sluggish as the temperature falls. But a moment's reflection shows

that cold-blooded are inferior to warm-blooded animals in that their activity is necessarily intermittent, except in tropical countries. A warm-blooded animal, on the other hand, keeps its organs bathed in a perpetual summer-heat (about 37° centigrade in man), and consequently its nerves and nerve-centres, its muscles and all its organs, are always ready to "give of their very best." The internal temperature remaining thus constant shields the organs of the body from the thermal irregularities of its outward environment, and enables the system to put forth the amount of effort that is required at any given moment. This power is an important factor making for superiority in the struggle for existence.

A long chapter might be written on the "multifarious precautions" taken by Nature for the preservation of life, but that would carry us too far afield. We will confine ourselves to the following observations.

The inner tissues of the body are hardly sensitive to pain; a sudden wound, penetrating deeply into the flesh, gives one rather the feeling, at first, of having received a heavy blow. The skin, on the other hand, is extremely sensitive; a small sore on the finger, a slight burn, or even ordinary chaps, can be very painful. This sensitiveness of the skin makes us do our best to avoid injuries. Were it otherwise, we should not be automatically warned against danger, in which case children, and doubtless older people too, would, out of sheer light-heartedness or thoughtlessness, expose themselves to a great many more wounds, burns, bruises, and the like (perhaps with serious consequences) than they do now.

The four examples that follow, taken from the world of plants, of beetles, of crustaceans, and of birds respectively, show us that Nature is equally solicitous for the welfare of all her children.

The root-fibres of plants are protected at their tips by a kind of sheath made of harder material, the resistance of which enables the root to penetrate the soil more easily. For the spreading of roots in the earth is accompanied by a slow circular movement not unlike that of a gimlet. Without this sheath, the delicate tissue of the rootlets would soon be bruised and worn away by continual friction against the gritty substances of the subsoil, such as grains of sand, sharp pieces of flint, granite, etc.; in any case, progress would be very difficult, especially in hard, compact soil. If the sheath should chance to be destroyed, new ramifications, each with a similar sheath, are put forth a little higher up the root, and the underground journey in search of nutriment is resumed.

The female larva of the beetle, when digging the hole in which she will be transformed into a chrysalis, makes it the size of her own body, whereas the male, who at that time is not bigger than the female, makes a hole twice as large as himself—probably without knowing the reason why. This extra labour seems useless at the time, but it is nevertheless necessary, because the horns of the male beetle are of practically the same dimensions as his body, and if his hole were not larger than that of the female he would not be able to get out.

The moulting period of the crab, the lobster, and other crustacea is heralded by a slit along the back of the shell. Through this relatively narrow opening the whole body has to pass. In order to facilitate the operation, the body is loosened from its shell

all the way round by the production of a semi-liquid substance which also serves as a lubricating agent.

Young birds before they are hatched have a hard, sharp projection at the end of their beaks, which is known as a "diamond." Without this weapon, the chick would hardly be able to break through the shell and emerge from the egg, for the mother-bird is not always at hand to assist the hatching process. Once outside, the "diamond" is of no further service and soon drops off.

* * *

To sum up, the superabundance of life in the air, in water, in the earth and on its surface ; the secretion of acid or bitter juices, and the growth of prickly hairs, thorns, etc., on plants, as a means of protection ; the devices for attracting insects resorted to by plants so as to ensure fertilisation ; the means they employ to scatter their seeds ; the maternal foresight shown by insects, although they die for the most part without seeing their posterity ; the varying quantity of seeds, eggs, or spawn, in order that the number of young may be in direct ratio to the dangers they will have to encounter ; the recuperative faculty (regeneration), always most powerful there where it is needed most ; the "multifarious precautions" taken by Nature ; the sensitiveness of the skin ; the contractibility of the iris, which prevent too strong a light from entering the eye and injuring the sight ; the movements by which the shape of the lens is accommodated to different distances, enabling us to see objects several yards off as clearly as those which are only a few inches from our eyes ; the instantaneous accommodation of the drum of the ear to the number of

vibrations, so that we are able to hear all sounds ranging from 30 to 23,000 vibrations per second ; the movements of the lungs, resembling those of a pair of bellows ;¹ the beating of the heart and the circulation of the blood ;¹ the movements of the œsophagus, the tube through which food passes from the back of the mouth to the stomach (its fibres are contractile and, by exerting pressure like a hand partly opening and shutting, they drive the food downwards, the force of gravity alone being insufficient for the purpose) ; the movements of the stomach, controlled by muscular fibres of three distinct types—longitudinal, perpendicular to the axis, and oblique, in the shape of an S, causing the food to be churned in every direction ; the movements of the intestine, which like those of the stomach have a twofold purpose—to blend the food thoroughly with the gastric juices, in order that chemical reaction may take place without difficulty, and secondly, to bring the nutritive chyle in contact with the greatest possible number of cells lining the alimentary canal, in order that it may find its way into the blood by osmosis ; the selection and absorption by each cell, from the substances brought to it by the blood, of those best suited to its purpose, the substances chosen varying according to the special functions of the cell ; vomiting, that is, spasmodic movements set up by the stomach in order to get rid of poisons or food which for one reason or another cannot be digested ; convulsive movements of the intestine (colic) and the copious secretion of mucus (diarrhœa), the object being to expel the poison in a diluted condition, after it has passed through the stomach ; the cough which is immediately provoked by the

¹ Of which we shall speak later on.

approach of any foreign body towards the windpipe—when, for instance, food goes down the wrong way (the object of this sudden and irresistible movement of the upper laryngeal nerve is to expel the foreign body and thus prevent death by choking); shivering; the means employed to ensure a constant temperature in the body; the means employed to ensure a constant degree of salinity; the welding together of broken bones, muscles, and nerves; the healing over of wounds; the means employed for increasing the number of red corpuscles at high altitudes; the battles waged by the phagocytes, and their increase in number whenever the necessity arises; the manufacture, in the serum of the blood, of antitoxins whose business it is to combat the harmful effect of poisons produced by pathogenetic microbes (the chemical composition of the antitoxin varies according to the nature of the poison secreted by these microbes); the numerous chemical combinations which give rise to the substances secreted by our glands; cases of spontaneous recovery from illness; the mechanical action of sucking in the new-born child of the human and all mammalian species, without which the feeding of the young and consequently life itself would be impossible; the adaptation of living beings to every kind of environment and to the most diverse circumstances; the constant co-operation of all our organs with the object of protecting the system as a whole and ensuring its proper working; the energy with which all creatures fight against destruction; the instinct of reproduction:—all these facts and many more besides, which will occur to everybody out of his own reading or experience, prove conclusively that Nature is making incessant efforts

not only to produce life but also to ensure its continuity.

We are therefore bound to admit that *the tendency of life to persist is the most universal of laws, and that life, so far from being a fortuitous phenomenon, is on the contrary the grand object which Nature sets herself to achieve.*

If another proof were needed to establish this truth, we might point to the fact that Nature, in her passion for life, and for fear lest we should forget to do all that we should do in order to live, has arranged that all the acts necessary to our existence should be more or less mechanical (as may be seen by running through the list given above). These important acts, then, are performed independently of our will, and even, for the most part, without our being conscious of them. Exceptions must be made for the acts of eating, drinking, and sleeping, which are to a certain extent within our control. "To a certain extent" only; for if we abstain therefrom for too long a period, our hunger, thirst, and desire for sleep will become so imperious that we are obliged to gratify them.

* * *

By the term "life" we mean the total activity of organised substance, without inquiring whether this activity is due to some particular vital force in Nature or is produced by the interplay of physico-chemical forces.

* * *

A question, however, that we may well ask is, whether Nature is content simply to produce life of any sort, or whether she has set herself some more definite aim.

A glance at the past will show us in what direction Nature is working.

The development of "things and beings" from what may be called "the beginning" up to the appearance of man may be divided into many successive stages of unequal length.

We do not know how our Earth came into being, nor how life made its appearance. But whatever the hypothesis adopted, it is certain that there was a time when, the temperature of the ocean, very high at the beginning, having gradually fallen, life was able to manifest itself, and it appeared.

The first living things were plants of extremely simple construction, unicellular algæ. This simple cell fulfilled in itself all the vital functions.

At the end of a period which was certainly very long, the first humble representatives of the animal kingdom made their appearance; these were the protozoa (infusoria, foraminifera) lying on the borders of the animal and vegetable kingdoms, gelatinous lumps without any enveloping membrane, something more than plants, but not yet animals.

The ascending movement continues: Cœlenterata (sea-anemones, medusæ, madrepores, corals) people the seas.

And successively: Echinodermata (starfish, sea-urchins); annelids; molluscs; Arthropoda (crustacea, insects); ganoid fishes; batrachians (amphibia); reptiles; dinosaurs; birds; marsupials; teleostean fishes (provided with a complete skeleton); placentals; finally man.¹

¹ The development of the vegetable kingdom was parallel with that of the animal kingdom. The Cryptogamia (the first terrestrial plants, but without flowers) appeared about the same time as the Arthropoda; the appearance of the Phanerogamia (plants with flowers) probably coincided with that of the teleostean fishes.

Scientists do not altogether agree as to the order in which the different animal species made their appearance, but the list given above would seem to be the most probable. In any case, the main groups may be said to have succeeded one another in the following order: (1) vegetable cells (unicellular algæ); (2) protozoa; (3) invertebrates; (4) fishes; (5) amphibia; (6) reptiles; (7) birds; (8) mammals without placenta; (9) mammals with placenta; (10) man.

The upward movement, in which we have named the principal stages, may be explained either by the theory of transformism or by the theory of mutations, that is, spontaneous variations.

Transformism explains the progressive development of living things by an influence acting on them as it were from the outside (natural selection, struggle for existence, etc.). The theory of mutations, on the other hand, asserts that this upward movement is chiefly due to a force exerted not inwards from without but outwards from within. This expansive force would thus be inherent in matter itself. Matter, or substance, would be organised and developed as soon as circumstances permitted. The impulse would not be external and gradual, but internal and abrupt.

Thus, for example, the appearance of crustacea with their shell and articulated claws, and of insects with their highly perfected compound eyes, is regarded by G. Bohn not so much as a case of *evolution*, as an organic and psychic *revolution* brought about in remote ages by a series of mutations or sudden, spontaneous variations.

From the standpoint of our theory, it matters little whether evolution has proceeded by imperceptible gradations or by sudden mutations. The

important fact for us is the upward trend itself, since this ascent, which has been going on for millions of years, is a clear indication of Nature's steadfast desire and her unwavering pursuit of the goal she has in view.

To examine in detail the formation and habits of each series of the beings which we have just enumerated would be useless for those of our readers who have studied these questions, and who will recall without further explanation the physical and intellectual progress that distinguishes every new series from the preceding ones. Let them only bear in mind that progress consists above all in the growing tendency of bodily organs to become more specialised, and in the ever-increasing number and complexity of their functions. As for those who have only a superficial acquaintance with the subject, they can easily compare the beginning and the end of the series: thus, contrasting the primitive seaweed or the protozoa with man, they may see in what direction the development has taken place, and realise the distance that has thereby been covered. They will see the abyss—which, nevertheless, has been gradually bridged over—between the starting-point, the protozoa, small shapeless specks of a gelatinous substance, possessing only the vaguest rudiments of sensation, and the point we have at present attained: Man, whose body is formed of a multitude of different parts, each of which has its own proper function to fulfil; Man, whose brain has discovered scientific and mathematical truths and reduced them to a system, who has measured the distances which separate the Earth from the neighbouring planets and even from the stars, who knows the weight of those planets and the composition of those stars; Man, who

every day produces new inventions or makes new discoveries for the use of the whole race, who helps his fellow-beings, encourages them by his sympathy, and nurses them in their sickness ; Man, who sacrifices himself for an ideal, who is moved by the sight of what is beautiful in Nature, and who can reproduce it by the arts—who by means of harmonious sounds expresses the most delicate emotions ; Man, who by means of language can communicate to others his most subtle thoughts, and by electricity transmit them instantaneously to all parts of the Earth.

And so many illustrious or obscure heroes, so many just and upright men, famous or unknown !

* * *

It is important, however, to notice that this development has not taken place by leaps and bounds. We must not think that one day there were protozoa, and that the next day the human race appeared suddenly in all its beauty and in all the plenitude of its intelligence. On the contrary, evolution has been extremely slow and often turned out of the direct path by various obstacles. Its course has therefore been by no means rectilinear, but has described numerous loops and zigzags. Before man was evolved, many varied forms of life succeeded one another, each rising only a very little way above the one before it, and some even falling back again. Nevertheless, in spite of everything, the upward movement continued, thanks to the irresistible tendency towards improvement. Life, then, passed through many stages and assumed many different forms before it came to Man.

But the progress made has always depended much more on mental qualities than on brute strength.

Thus, the gigantic reptiles of the Secondary Period with their tiny brain were superseded by the somewhat more intelligent mammals of the Tertiary Age. Later on, these in their turn, though physically stronger, had to make way for the ancestors of the quadrupeds existing at the present day, in whom again there was slightly greater cerebral development.

A similar relation exists between man and the great anthropoid apes. In their structure and bodily organs the latter can claim superiority, being both stronger and more agile than man ; but, on the other hand, man's brain is much larger and more skilfully constructed ; hence it is man that has come off victor in the struggle for supremacy.

The structural resemblance between quadrupeds, quadrumana, and man is unquestionably very great : the skeleton in each case is built on the same lines, the organs are the same, and they function in the same manner (eyes, ears, tongue, muscles, nerves, heart, liver, kidneys, arteries, lungs, etc.). It would have been easy for Nature to concentrate her selective process on physical strength, and simply increase the power of the muscles ; but she solved the problem much more neatly by developing and perfecting the brain.

In considering the struggle for existence, especially amongst the lower animals, one is rather apt to assume that strength is the only thing that counts. Yet it is evident that there are many qualities, both intellectual and moral, which play an even more important part, such as attentiveness, perseverance, energy, patience, courage, adroitness, power of observation, and judgment. *And it is precisely the importance of these qualities in the struggle for existence that has led to their develop-*

ment, first of all in the lower animals and afterwards in man.

In all probability, the importance of these mental qualities is only imperfectly realised by people who have never studied animals in their natural state. So we will take an example : a tiger on the prowl.

To begin with, the tiger has to observe which spots are haunted by the animals on which he wishes to prey, so that he may lie in wait for them there and not elsewhere (power of observation). Next, he will have to select, alongside a certain path or near such and such a pool, a lurking-place so concealed from view as to enable him to see what is going on while remaining invisible to his victim (judgment). There he will often have to wait and watch for a very long time (patience). Now at last the victim slowly approaches, suspecting no danger and stopping every now and then to browse. During these minutes, which must seem like hours to a ravenous stomach, the tiger has to remain absolutely motionless in order not to give the alarm. And now the doomed animal is only a few paces away, and a quiver of intense desire runs through the frame of our hunter ; every second adds to his excitement. Yet in spite of the temptation he waits—waits until his prey is well within his reach (self-mastery). At last the moment so patiently and impatiently awaited has arrived ; with one bound the tiger springs on his victim and kills it (grasp of the situation, decision, rapidity of execution, agility). Should the victim scent danger and make its escape at the last moment, all has to be begun over again (perseverance). In short, all the mental qualities required by a hunter when stalking game are, for exactly the same reason, equally essential to the beast of prey.

There is no doubt at all that the amount of food obtained by the flesh-eating animal, as by the hunter, will depend entirely on the degree in which these qualities are developed.

Again, in the great majority of cases it is intelligence rather than strength that enables an animal to escape from its foes or to rescue its young from peril. We shall see further on by what clever feints and stratagems partridges, thrushes, woodcocks, the females of deer, etc., protect their young when in danger of being devoured. Also the many tricks resorted to by the fox in order to escape from its enemies are familiar to us all.

But the struggle for food being particularly keen amongst animals of the same species, since they feed on the same kinds of prey, the amount of which is generally limited, it follows that, in order to survive, especially in time of scarcity, the carnivorous beast must not only be stronger and more intelligent than the animals it pursues, but also more persevering, intelligent, etc., than its own congeners. This last remark requires some amplification.

It is not uncommonly believed that all animals of the same species stand on the same intellectual footing. If we see a lion, an elephant, a partridge, a goose, or a hare act in a certain manner under certain circumstances, we are apt to assume that all lions, all elephants, all partridges, all geese, and all hares will act in precisely the same manner when confronted with similar circumstances, and that consequently none of them is intellectually superior to his fellows. Nothing could be further from the truth. Every animal, on the contrary, has an individuality, a personality, a character, an intelligence of its own, distinguishing it from its companions. Those of our readers who have kept

a number of cats, dogs, or birds of the same species must surely have had frequent occasion to observe how widely each individual differs in its behaviour from the rest.

In order to test the truth of this assertion, all one has to do is to observe, quite superficially, when one happens to be in the country, the way in which birds behave when at liberty. We need only throw down a few seeds or bread-crumbs on a piece of open ground, and then wait at a little distance, without moving. If the experiment is made in winter-time, when food is scarce, a number of birds—sparrows, for instance—will soon appear on the scene. And amongst this flock of birds there will always be some that are bolder, more alert, more courageous, more enterprising than the rest. While the timid ones remain at a respectful distance, the braver spirits after a little hesitation will approach by hops or short flights and, seeing nothing to make them suspicious, will swoop down on the tempting morsel and carry it off or devour it on the spot according to their degree of hardihood or their assurance of safety. The timid ones keep their distance, advancing a little, only to retreat again; the least movement on our part causes them to disappear, whereas the braver birds sometimes set us at defiance, hopping up closer still in order to secure a final crumb.

This simple experiment has already separated our sparrows into two classes: the brave and the timid. A longer course of observation would show us that among these little birds, as among all other animals, there are some that make better parents than others, some that are more affectionate, more self-sacrificing, and so on with regard to many other qualities.

Professional animal-tamers and trainers in circuses and menageries also know very well that their "pupils" are not all alike in character and mental aptitude. This observation applies to the whole animal tribe, and its truth is nowhere better attested than in the case of monkeys, especially as regards attentiveness, good memory, and willingness to learn.

Of two monkeys belonging to the same species, one will be so feather-headed, so easily distracted by a buzzing fly or the opening and shutting of a door, that he can never be taught anything; whereas the other will not take his eyes off the instructor during his lesson, and by dint of application will quickly understand what he is expected to do, and will soon become a real artist in his own line.

We have already pointed out the effect of these differences in character when it is a question of obtaining food, but this mental divergence between individuals of the same species is of all-round importance. Indeed, wherever rivalry and competition exist, no matter what form they assume, mental and moral qualities constitute a powerful factor in the attainment of victory.

This truth is very clearly manifested, for example, in the behaviour of a great many different kinds of animals during the mating season.

When the males keep a harem, they are obliged to fight one another for the possession of the females; and, generally speaking, the conqueror will be the one who can supplement his physical strength by powers of attention and observation, perseverance, courage, skill, patience, etc. These qualities will enable him to see the tactical errors of his opponents and to profit by them.

In the case of animals living in pairs, the result is the same and reached in the same way. For here again, out of those that are strong it is the bravest, the most skilful, the most intelligent, and the one who best knows how to avail himself of circumstances, that will triumph over the rest.

Sometimes, instead of clearing rivals out of the way by brute force, as is generally the custom with mammalia, the object is to excite the emotions of the female. Amongst many species of monogamous birds and certain other animals, the females waver for a long time in their choice, reject the advances of the male, and even flee from his approach. The suitors are thus obliged to go through a regular process of wooing. Sometimes it is merely a question of pursuit, in which case the lover has only to give proof of his perseverance. But often he has to go through all sorts of leaping, dancing, and other evolutions of a more or less acrobatic nature (jacanas, cranes, manakins of South America, *Paradisea minori*, grouse, etc.).

Among those males that show the most perseverance, it is the one who is clever enough to display his beauty and skill to the best advantage that will succeed in touching his lady-love's heart.

In other cases, the male bird endeavours to surpass his rivals in song; and the favoured lover, one of those who show most perseverance, will be he whose intelligence prompts him to throw the most passionate feeling into his notes.

Or again, the males have to show themselves possessed not only of perseverance but also of an uncommon faculty of endurance. Such are the qualifications demanded by the young queen bee when on a bright and sunny day she accomplishes

her nuptial flight. No sooner has she left the hive than her wings bear her straight upwards, higher and ever higher through the air. Immediately all the drones from the neighbouring hives, of whom there are considerable numbers, and who have been waiting for this moment, fly after her. But meanwhile the youthful queen continues to "scale the heights of heaven," and in the course of this swift and exhausting upward flight those who are inferior in strength or ardour, in energy or perseverance, give up the pursuit one by one. At last only those remain who are really worthy of transmitting life. And it is only then, high up in the sky, that the queen bee makes her choice among those who are worthiest.

It also happens that, when the proper time comes, the male—among birds especially—is arrayed in a special dress, more splendid than his ordinary attire. The better his health, the more brilliant the colours in which he is decked and the more likely to fascinate his future mate. (An animal's state of health is always indicated by the appearance of his coat or of his plumage.) Now the male that is in the best condition is precisely the one whose intelligence, activity, watchfulness, power of observation, and perseverance have enabled him to provide himself most regularly with the most plentiful supply of food. These qualities, by keeping him in good condition, will not only result in his being adorned with livelier tints, but will also allow him to utilise them to the full and display them to the best advantage before the eyes of the hen-bird looking on. In a word, these qualities enable him to urge his suit intelligently and for a protracted period (golden pheasant, peacock, Chinese peacock pheasant, bullfinch, goldfinch, Australian pigeon,

great bustard, crested wren, frigate-bird, bird of paradise, ruff or *Machetes pugnax*, etc.).

When we say that the hen-birds choose their mates, we do not mean to assert that their choice is made consciously, or that they say to themselves, for example : “ So-and-so shall be my mate because he danced longer than the rest, or because he sings with a more liquid note or has the brightest-coloured feathers round his neck.” All we wish to convey is that the female is unquestionably affected by dancing, song, and colour, and that she will more readily accept as partner the bird that has stirred her feelings most deeply. We have here a choice which, though instinctive and unconscious, is nevertheless real.

It must be said, however, that in the opinion of certain ornithologists the hens exercise no choice at all, unconscious or otherwise, but are fated, so to speak, to belong to the cock-birds that are capable of singing, dancing, or strutting about longest ; the others having withdrawn from the contest because they were lacking in perseverance, energy, or amorous passion. These scientists also declare that the gaudy colours do not excite the female, but only attract her attention, keep her interested, as it were, and prevent her quitting the society of the most richly endowed male. But even if we accept this theory of the female’s indifference as to which of her suitors is the handsomest, the most vigorous, or the best songster (though it is contradicted by a large number of well-attested facts), it still remains true that the males of inferior strength, energy, perseverance, and ardour eliminate themselves by giving up the struggle, and thus make way for the more worthy—that is to say, those who possess in the highest degree the qualities

which are of value for the individual and for the race.

Whichever theory we adopt, it is highly probable that a male with too little intelligence to be able to procure enough food for himself in time of dearth, or to come off victorious in battles with his rivals, or to make his attractions felt by the female, or to touch her by his perseverance, would be "the last of his race."

On the other hand, it may be said in a general way that, among birds as well as other animals, the females naturally fall to those males who, besides being among the foremost in strength, have the best mental and moral equipment. And these qualities—energy, muscular strength, organic soundness, courage, skill, patience, intelligence, power of attention, judgment, endurance, perseverance, etc.—are transmitted to their descendants.

The inevitable sequence of natural phenomena tends, therefore, to produce a brain possessing the qualities we have just enumerated, and served by muscles and organs well fitted to fulfil their proper functions.

* * *

To return to man: we see that his psychical progress has been continuous. Between primitive man and man of the present day there is truly not much resemblance.

In speaking of the Fuegians, Darwin tells us that when he first saw them on their desolate shores, he got a very clear idea of what the savagery of our ancestors was like. The Fuegians were completely naked and besmeared with coloured pigments. Their hair was long and matted together. Their excitement at the sight of strangers was so great that they foamed at the mouth. Their repulsive

features expressed the emotions of surprise, terror, and anger. These people had no form of government. They lived like wild beasts; that is to say, they lived on what they could "catch." They killed without pity all those that were not members of their own small tribe. Such was the state of the Fuegians at the time that Darwin saw them, and such was also the state of our first ancestors, thousands of years ago. Man has progressed since those far-off days. No one can deny it.

What conclusion are we to draw from this continual upward movement, starting from the protozoa and terminating in mankind, from this steady progress, both physical and mental, which living beings have apparently been unable to resist, and which has been made in spite of them, as it were, or at least independently of their own will? At what conclusion must we arrive when we notice that in general, as each new series of beings comes upon the scene, the domain of its activity and intelligence is also enlarged, that every series is more capable of higher and more numerous activities than the preceding one?

The conclusion seems evident. All the past, from the period when our planetary system was only a nebula up to the present time, indicates clearly that *Nature, through the working of her inevitable Laws, not only strives to put forth as much life as possible, but always tends to endow that life as richly as possible with intelligence.*

* * *

Although we are only speaking of what takes place on our own globe, it is probable that Nature acts according to the same principles—or, which comes to the same thing, that the unalterable

sequence of phenomena brings about identical results—on the planets of other solar or stellar systems. Life in that case would be universal and everywhere intelligent.

Furthermore, it may be that life and intelligence have attained a much higher state of development under the influence of suns more active than our own, and that, compared with what exists on planets which are bathed in the vivifying light of double or triple systems of suns, such as are scattered throughout the immensities of space, our terrestrial evolution and progress are only of the nature of a humble and tentative sketch.

* * *

It is clear even to the superficial observer that every living being, be it plant, animal, or man, is obliged to conform to certain elementary rules of conduct under pain of extinction; this is certainly true of the race if not of the individual. The elements of morality, then, are of very ancient standing. A general demonstration of this truth has already been put forth in the preceding pages; we shall now enter more into detail.

* * *

First let us examine briefly the morality of the plant.

In order to have vigorous offspring—that is to say, in order to give to future generations the power of living a normal life—we find the flower in many cases refusing to fertilise itself, from a purely altruistic motive. The means used to secure the diffusion of pollen to other flowers is frequently a costly process (production of perfumes, gay colours, sweet juice, etc., to attract insects). Afterwards the flower has to provide for the future

of its children by enclosing along with the germ a store of nourishment large enough to last until the young plant has developed its own roots and leaves, and is able to fend for itself. The whole is carefully wrapped in an outer casing of sufficient strength to ensure the contents against any ordinary accident. Finally, the mother must give the seeds the power of dispersing themselves, so as to fall on a soil favourable to their germination. Thus the plant approves itself an intelligent and devoted mother, and literally does all in its power to secure the existence of the children, even though its own life succumbs to the effort. *This is the first example of maternal morality that Nature presents to us.*

Some of our readers may find fault with us for speaking of animals and plants in terms that are usually applied only to human beings. To such we would reply, in the words of Le Dantec, that the idea of intelligence is for us inseparable from the idea of life. And we may add that the idea of morality—that is to say, conduct—is up to a certain point inseparable from the idea of intelligence.

* * *

Let us now turn to the consideration of insects, mammalia, birds, and fishes.

Many insects present an example of maternal care and foresight which is all the more remarkable because the mother is destined never to see her children; and yet, in spite of this fact, her moral sense impels her to surround them with everything necessary to their comfort.

The simplest case is that of the majority of butterflies, which, in order that their progeny may be hatched under favourable conditions, lay

their eggs on plants having leaves of a kind most suitable for the young grubs to feed upon. Thus the mother's choice will fall upon the cabbage or the cress, the rape, the poppy, the poplar leaf, and so on, according to the particular species of butterfly.

The mason-bee takes a great deal more trouble. With ardent zeal, inspired perhaps by love, she builds a certain number of cells side by side, lined with a sort of stone casing, so as to protect the nursery against cold and rain and enemies from without. For the construction of these cells and this casing, the mason-bee uses small grains of sand, selected, of course, one by one, and these miniature blocks she cements by means of earth moistened with her saliva. The interior of the dwelling, which has to be quite smooth so as not to injure the very tender skin of the larvæ, is covered with a layer of fine earth rendered adhesive by saliva. It goes without saying that this good and far-sighted mother deposits a store of honey in each cell to serve as food for the infants.

The leaf-cutting bee follows a different plan. Having chosen a natural hollow in the ground, she constructs a number of thimble-shaped receptacles out of leaves taken from lilacs or rose-bushes, which she cuts into small pieces. These receptacles are destined to contain one egg each, together with some honey-paste. Bits of leaf cut to a circular shape are made to serve as lids. A series of these nests are thus fashioned and duly provisioned by the mother, who then covers up her handiwork with a heap of dry leaves. Fabre has counted in a single nest as many as 1064 separate pieces of leaf, all cut up by this devoted mother in order that they might serve the purpose she had in view.

This work, like that of the mason-bee, represents

a long and laborious series of efforts for a creature so tiny and so short-lived. A long and exhausting task of this nature, performed for the benefit of infants yet unborn, points to a highly developed moral sense on the part of the mother. Her oft-repeated exertions also manifest the important quality of perseverance; for during these painful labours to ensure the well-being of her children, which she is determined to carry through at all costs before dying of exhaustion, she never allows herself to be discouraged by any check or obstacle that may arise.

* * *

We will digress at this point in order to observe that perseverance, or continuity of effort, appears to be one of the qualities which are of most value both to the individual and to the race.

If, starting from the top, we go down the whole scale of the animal kingdom, we shall find that, although intelligence steadily decreases, persistency of effort remains equally strong throughout. That fact certainly seems to prove the capital importance of this quality for the continuous propagation of life.

The will to live and to develop is present in the tiniest insect as fully as in man, and admirable perseverance is shown in the pursuit of this goal.

The same observation applies to plants. Their roots are most energetic in the search for nourishment, which is often a lengthy business; and the leaves and stalks never relax their efforts to obtain the light which is essential to their growth. Climbing plants make unremitting attempts to find something to hold on to.

The object of this continuity of effort as seen in animals and plants is not only to continue to

exist as individuals, but also, as we have said, to ensure the life of their progeny. That has been shown by the examples of the mason-bee and the leaf-cutting bee. We shall find numerous other instances in the following pages. In the meantime, let us cite two interesting cases: that of the cray-fish, which for greater safety keeps its eggs under its body for about six months and a half, cleaning them and moving them about at frequent intervals, in order that they may be provided with the necessary oxygen; and that of the female kangaroo, which, in spite of the fatigue, carries her young for about eight months in her pouch, where the udders full of milk are situated. In truth, the more we study Nature the better we shall understand the importance of sustained effort.

* * *

All mammals lavish long and affectionate care on their offspring. As soon as the young are born, the father and mother have no thought except for their welfare. The lioness, the tigress, and the she-wolf stay at home to attend to the wants of the "babies," whilst the father goes out hunting, and, before satisfying his own hunger, brings his prey home to feed the mother and her family. But the care of the parents does not stop there. They also teach their children how to hunt game. This teaching, this care and protection, only cease when the young can provide for their own needs.

Birds do as much, perhaps even more, because the parents have first to build a nest. This is a long and laborious job. The materials used for a nest vary according to species and also according to circumstances; they comprise moss, blades of

grass either withered or still green, small roots, feathers, hairs, wool, twigs, down taken from various plants, and always some soft substance to serve as lining and make the nestlings comfortable. What an amount of searching, what a number of journeys, how much time and hard work must go to the building of a bird's nest ! ¹

When the eggs are laid, the mother, sacrificing her love of liberty and movement, forces herself to remain for long monotonous days crouching on the nest with outstretched wings, an extremely fatiguing position. Her only pleasure then is to listen to the song with which her mate seeks to beguile her weariness. But as soon as the little ones are hatched, singing is out of the question. Much quick flying to and fro has to be done, for many beaks are hungrily gaping for food, and the father untiringly brings home the most succulent morsels he can find for his mate and the fledglings, only thinking of himself when the whole family is satisfied. A wren has been seen returning to its nest about every three minutes with food in its beak, and keeping this up for fourteen hours on end.

As soon as the mother-bird can leave the nest without danger accruing to her brood, she bravely takes her share in the work to be done.

A pair of tomtits with a large family were seen hunting for food for sixteen hours without resting, during which time they brought back no fewer than 2000 caterpillars or grubs : a marvellous example of love and perseverance !

Be it also noted that when the nestlings are too young to digest the food that is suitable for their

¹ Among the swallow tribe, for example, it is usual for the parent birds to spend eight days industriously pecking up mud or soft earth and welding it with their saliva into a glutinous mass.

parents, the latter often make choice of special articles of diet, such as grubs and caterpillars (instead of seeds or grain), which they will sometimes partially digest before transferring them to the beaks of their offspring, so that they may be more easily assimilated.

It is in this way that the majority of granivorous birds (sparrows, yellow-hammers, greenfinches, etc.) feed their young—first of all, with insects that they have swallowed and that are half-digested, then with freshly caught insects, and finally with seeds.

By a partial process of digestion, pigeons convert the grain stored in their crop into a semi-liquid substance, and the young pigeon, inserting his beak into that of his father or mother, is fed with this “milk.” Later on, the parents prepare a somewhat thicker kind of pap, also made out of grain. Parrots do the same thing.

When at last they are strong enough to leave the nest, the young birds of every species are shown by their parents how to use their wings—and this, like all teaching, requires great patience.

When a female redbreast, for instance, wishes to give a lesson in flying to her young, she places herself at some distance from the nest with an appetising caterpillar in her beak. At once the young birds begin to clamour loudly for this dainty morsel; but as their mother will not come any nearer, they are compelled to leave the nest and to flutter towards her from branch to branch. And the same process is repeated as often as may be necessary. (Does not this method of instruction remind one of a fond mamma teaching her baby how to walk?)

Even among the least sociable of the carnivora and the most solitary birds of prey this inborn

parental love may be seen at all times in active operation. It could not well be otherwise, for without this unceasing care and devotion the young would run the risk of starving to death or succumbing to the perils which always beset the weak, and the race would die out. Hence it is that parental love—especially in the case of the mother—is always most highly developed in animals whose young stand in special need of protection.

Who is not familiar with the heroism shown by the cat, and by most other animals, when they have to fight for their new-born offspring ?

It is also a well-known fact that monkeys show intense solicitude for their young, and continue to do so for a long period. The male defends his family with extraordinary courage, and the mother never abandons the baby she is suckling, however great the danger that threatens her. If wounded by the hunter's bullets, she still has the presence of mind to bestow her precious burden on the branch of some tree before dropping down to die.

The female gibbon has a passion for cleanliness which is not always appreciated by her children. With unfailing regularity she carries them to some neighbouring stream or lake, and washes their faces in spite of their cries and protests. These excellent mothers devote much time and care to keeping their children clean.

Animals which are not strong enough to protect their young by physical force will often have recourse to stratagem. When a sudden danger threatens the nestlings of the partridge, the thrush, the grouse, the wild duck, the warbler, the wagtail, and others, the mother-bird flies away close to the ground, awkwardly and not too fast, imitating

to the life the flight of a wounded bird. The prowling quadruped, thinking he has an easy prey, follows her up with his mouth watering; but as soon as the mother judges that she has put a safe distance between the enemy and her brood, she shoots up into the air uttering cries of triumph.

The doe that fears for her fawn will likewise lure on the pursuer by running slowly at first; then a sudden spurt enables her to return by a circuitous route to the place where she has left her darling.

Among certain species of fishes, the father shows more parental love than the mother. Thus, it is the male stickleback that constructs out of river-grass the nest in which the eggs are deposited; and whereas the female is indifferent to the fate of her offspring, he will valiantly dispute the passage and attack fishes ten times bigger than himself. Like an intelligent father, he moves his fins in such a way as to create a current of water through the nest (which has two openings), thus keeping it supplied with the necessary amount of oxygen. When the young sticklebacks are hatched and run thoughtlessly into danger by going too far from the nest, their father takes them in his mouth by sucking in the water and brings them back again.

Similar neglect of the eggs is shown by the female hippocampus. It is the male that keeps them safe in his ventral pouch until incubation takes place.

* * *

It is among birds and mammals, then, that we find *the first example of family morality*. In the case of plants and, generally speaking, of insects,

the young ones are cared for only by the mother ; among mammals, birds, etc., the father does his duty by them as well. Working for his children and for his mate, he acts, in all simplicity, on truly altruistic principles *in that he thinks of others besides himself.*

Thus we see that the great virtue of parental devotion was practised long before man appeared on this earth.

It should be added that, from the remotest ages, heredity has ensured the survival of species by transmitting this altruistic instinct of the parents to their posterity ; and the certainty of such survival—other things being equal—has depended on the degree in which this parental love, with the intelligence implied therein, was developed.

* * *

Having studied the subject of family morality, if we go on to examine the relations existing between the members of societies or groups formed by undomesticated animals, we shall find that a new bond accompanies the emergence of new duties.

With many birds and mammals the morality only lasts as long as the family keeps together ; as soon as the young are strong enough, the family generally disperses, and the ethical sense remains in abeyance until the following season. With gregarious animals, on the contrary, the family duties are no longer the only ones, for every member of the herd or flock has also duties to fulfil towards all the other members : duties of fair-dealing (a tuft of grass must not be snatched from another because it happens to be a nicer mouthful), duties of patience, of forbearance—in these communities quarrels are rare—and also of obedience to the

leader who governs for the general good. But, above all, duties of mutual help, protection, and union.

Examples are so numerous that it is not easy to make a selection. Here are some, however, taken at random.

Monkeys search for and kill each other's parasites, and, when they have passed through prickly undergrowth, each will oblige his neighbour by pulling the thorns out of his coat in places that the latter cannot reach. It often happens that blind animals are fed by their companions. Darwin mentions the case of crows that used to feed two or three of their companions which were deprived of sight; he also tells us of an old pelican which, though stone-blind, was nevertheless kept fat and flourishing through the kind attention of its fellows.

Kropotkin furnishes us with an interesting example. He says, in his book on *Mutual Aid*:—

“As to the big Molucca crab (*Limulus*), I was struck (at the Brighton Aquarium) with the extent of mutual assistance which these clumsy animals are capable of bestowing upon a comrade in case of need. One of them had fallen upon its back in a corner of the tank, and its heavy saucepan-like carapace prevented it from returning to its natural position, the more so as there was in the corner an iron bar which rendered the task still more difficult. Its comrades came to the rescue, and for one hour's time I watched how they endeavoured to help their fellow-prisoner. They came two at once, pushed their friend from beneath, and after strenuous efforts succeeded in lifting it upright; but the iron bar would prevent them from achieving the work of rescue, and the crab would again fall upon its back. After many attempts, one of the

helpers would go in the depth of the tank and bring two other crabs, which would begin with fresh forces the same pushing and lifting of their helpless comrade. We stayed in the Aquarium for more than two hours, and when leaving we again came to cast a glance upon the tank: the work of rescue still continued!"

Kropotkin also informs us that pelicans "always go fishing in numerous bands, and, after having chosen an appropriate bay, they form a wide half-circle in face of the shore, and narrow it by paddling towards the shore, catching all fish that happen to be enclosed in the circle. On narrow rivers and canals they even divide into two parties, each of which draws up on a half-circle, and both paddle to meet each other; just as two parties of men dragging two long nets should advance to capture all fish taken between the nets when both parties come to meet."

The wolves of the Russian steppes hunt in packs. By means of joint action they succeed, where each one acting separately would fail.

Everyone knows how beavers co-operate in building dams, some of which are intended to keep the water at a more or less constant level, while others serve to break the force of the current. They also dig canals in common, by means of which the timber that they have felled on either side is floated downstream.

The following touching practice is found among ants. When one of them lights upon something to eat, it first of all consumes what it needs, and then fills its crop with food to be disgorged later on for the benefit of the larvæ in the ant-hill, or of any adult ants it may encounter on its way that have not had time or opportunity to satisfy their

hunger. A good instance, this, of practical charity, or, more strictly speaking, of reciprocity, for the giver of to-day will perhaps be the recipient of to-morrow.

* * *

Should it be a question of defence, the duty of protecting the community will fall upon the strongest of the males.

For this reason, whenever a herd of bison is threatened by some danger, the females and their young take up their position in the centre, while the males form a circle round them so as to ward off the enemy.

A somewhat different plan is adopted by vicuñas (a kind of llama). When they are closely pursued, the bravest of the males remain behind in order to cover the retreat of the females with their young and allow them to escape.

Brehm tells us that one day, when hunting in a virgin forest, he suddenly heard a tremendous flapping of wings followed by piercing screams. An eagle had pounced upon a young monkey and was trying to carry it off, while the victim, tightly clasping a branch with all his four limbs, was desperately calling for help. Immediately the whole troop of monkeys (*Cercopithecæ*) flew to the rescue, and a dozen of the biggest threw themselves upon the eagle. Seized, scratched, and bitten on every side, the would-be ravisher's only anxiety now was to get out of an awkward scrape. He finally dropped his prey and flew off, but not without leaving a considerable quantity of feathers behind him.

Whenever animals forming part of the same herd or group, and therefore known to one another, find themselves confronted with some danger of

an unfamiliar sort, it is noteworthy that the initiative is always left to one of the older males, presumably the one who combines physical strength with the greatest amount of practical intelligence, derived from experience. In this connection, an incident which was recorded by Brehm (and afterwards quoted by Darwin) can hardly be recalled without emotion.

In Abyssinia this learned ornithologist encountered a large troop of baboons which were crossing a valley. Some had already reached the opposite mountain, whilst the others were still in the plain. But the old males came down again in great haste when they saw the laggards attacked by the dogs belonging to the party, and assumed so threatening an air and uttered such loud cries that the enemy drew back. However, the dogs were set on them again just as all the baboons had gained shelter in the mountain, save a young one about six months old, who, having remained behind perched on a rock, was soon surrounded by the pack. Then, seeing the danger to which the "baby" was exposed, one of the most powerful males redescended the mountain *alone*, slowly made his way back to the little one, fondled it, and bore it away in triumph. Happily, the dogs were so surprised that they allowed the hero and his precious burden to depart in peace.

The mutual service, however, most commonly rendered by gregarious animals is to give their comrades warning of danger. Rabbits stamp on the ground with their hind feet, and chamois do the same with their fore feet.

6 Sentinels are posted by many birds and also by a few species of mammals. We may instance wild ducks and geese, cranes, parrots, flamingoes, sea-

gulls, bustards, rooks and crows, storks, prairie-dogs and prairie-hens, zebras, wild horses, beavers, otters, and walruses. With monkeys the duty of keeping guard is entrusted to the head of the troop, who utters loud cries when he wants to warn his "tribe" of impending danger.

This practice of posting sentinels, as E. P. Evans very justly points out, not only implies a high degree of foresight and intelligence, but is also a proof of remarkable moral qualities. For sentinels must keep watch while the others are resting or feeding, and that alone requires an uncommon effort of will; but an even higher degree of morality appears in the fact that they are prepared to sacrifice their lives to ensure the safety of their comrades.

It is only fair to add that these sentinels do not always act voluntarily, being often selected by their companions. Yet it is none the less true that, once appointed, they accept the responsibilities of their office and realise the duty of the individual towards the community to which he belongs.

With gregarious animals the necessity for reciprocal service, aid, and protection being always paramount, ethical sentiment is always kept alive: morality therefore has made a great stride. *It is the first example of tribal morality.*

Long before the appearance of man, many birds and quadrupeds, including monkeys, had joined together in tribes or clans, partly through natural affection, and partly for the sake of mutual protection. The social instinct which made such co-operation and mutual assistance possible was one of the most important steps taken on the long path of evolution.

Finally, certain insects, such as ants and bees, set up fixed dwelling-places, carefully ordered and

provided with all the comfort and convenience necessary for regular work. In these communities, which were no longer nomadic, the work, being considerably heavier, had to undergo specialisation. To such an extent is this carried out that when bees, for instance, have to perform some definite task they attend to no other, however great the temptation may be. Thus, those that are entrusted with the task of providing water will not allow themselves to be allured by any sweet liquid; and *vice versa*, those whose duty it is to extract nectar from the flowers will not touch the water that may be offered to them, even in a time of drought, when water is urgently required for the larvæ in the hive. Bees understand that in order to do the work demanded by the hive quickly and well, it is necessary that each should occupy itself exclusively and conscientiously with the particular job that has been assigned to it, and not act according to the impulse of the moment or be diverted by chance encounters. Each bee has its own programme, and neither shirks nor modifies it. Each individual cares only for the general good, and without complaining accepts the allotted task, cost what it may. (In summer, during the full working season, the working bees die in six weeks, exhausted by their formidable labours.)

Another equally striking example of the sacrifice of the individual, when occasion arises, in the interests of the community, is presented by bees.

If a queen and some of the working bees are taken from the hive and placed in a receptacle together, with a little honey beside them, it will be found that the workers feed the queen first, and only after having performed this duty will they

take a little nourishment themselves. But by and by, as the store of honey diminishes, the workers will cease to eat at all, and will reserve the few remaining drops for the queen. One after another they will allow themselves to die of starvation, until the last worker of all, the one which has been able to endure this privation the longest, gives a final drop of honey to the queen with her customary care, and in her turn drops down dead from exhaustion. All these sacrifices are made in order to prolong and, if possible, to save the life of the queen, since it is on her that the future of the whole community depends.

In another connection, it is to be noted that the most important principles of "public hygiene" are observed by bees in their hive, and, in this case also, for the greatest good of the greatest number. Thus, the workers are always most careful to deposit their excreta outside the hive. But the queen bee never goes out, and the drones, unfortunately, are very dirty in their habits. A certain number of sexless bees are therefore told off to keep the shelves, walls, and floor free from ordure, all of which is conveyed by them outside the hive.

If a bee happens to die, or if one of the larvæ succumbs within the common dwelling-place, its corpse is immediately carried away to a certain distance.

Should there penetrate into the hive some animal of too great a bulk to be removed, without delay its body is covered with a layer of propolis, which renders its decomposition inoffensive.

Lastly, the temperature of the hive being always at a high level, and the atmosphere being liable after a time to become unhealthy, some of the sexless bees undertake the function of ventilators:

facing in the same direction, they cause their wings to vibrate rapidly, and thus produce a draught which brings in fresh air.

Ants, likewise, are sociable, industrious, and methodical, and bring all their energy and intelligence to bear on the well-being of the community.

Their eggs require much greater care even than those of the bee, not only because they take a much longer time to hatch, but also because every other moment they have to be conveyed from one part of the ant-hill to another, according to the degree of heat, moisture, etc., that prevails. These constant flittings demand unceasing vigilance and much hard work on the part of the nurses.

Bees and ants, then, exemplify the highest development of morality which animals have been able to reach: the morality of the citizen.

They are much mistaken, therefore, who allege that Nature preaches only the doctrine of egoism, of "each one for himself," and that she leaves no room for mutual aid or the generous promptings of sympathy and benevolence.

The foregoing pages have already demonstrated the falsity of such an assertion. Nevertheless, the error is one of such tenacious growth that we shall beg leave to enlarge yet further on the subject, even if it slightly interrupts our account of moral development.

On every page of the history of Europe we read accounts of battles, and are informed of the number of dead bodies left on the field, of countries invaded, of territories ravaged with fire and sword. Historians do not spare us the description of a single fight; they delight in expatiating on civil wars and on wars of conquest. So much so, that a

denizen of Jupiter, for instance, would rise from a perusal of our history books with the impression that the nations of Europe had always been fighting each other without mercy or respite, and that the inhabitants of this planet had never done anything but wade through rivers of blood.

It would not be the Jupiterian's fault if he held such an erroneous opinion concerning us ; it would be the fault of the historians, who, while relating tragical events in great detail, have passed over in silence facts of far greater import for the human race : the institution of all manner of philanthropic works, the foundation in every country of societies for the advancement of science, literature, and art, the innumerable inventions and discoveries which have so largely contributed to the development of human life,—in fact, all those peaceful activities, great and small, which have gradually transformed the cave man into man as we see him at the present day.¹

We must needs admit that inventions, discoveries, and philanthropic institutions have done infinitely more to “ mould ” the human race than all the

¹ The following inventions may be mentioned at random :—the construction of huts ; the invention of wheels and weaving ; the making of bricks and mortar ; the discovery of metals, which led in time to the manufacture of all sorts of agricultural and industrial implements, surgical and other scientific instruments ; the invention of the arch, which enabled men to build bridges and aqueducts ; the making of roads facilitating transport and intercourse not only in the interior of a country but between one country and another ; the invention of printing, which enables scientists, philosophers, and men of letters to impart their thoughts to all mankind ; postal organisation ; the discovery of the properties of steam and electricity, followed by the invention of the steam-engine, locomotives, railways, and telegraphy, with and without wires ; the discovery of microbes and the scientific treatment of infectious diseases ; the use of anæsthetics ; the invention of motor-cars, aeroplanes, etc. etc.

battles which cumber our historical records. (What remains now, for instance, of the conquests of Alexander, Cæsar, or Napoleon?) The reason is that wars, though formidable enough in many cases, have been intermittent, whereas the effect of the smallest discovery or invention is continually making itself felt.

The same remark applies to the subject with which we are now engaged. We watch the struggle for existence, and are hypnotised, as it were, by this spectacle, which, like the battles of history, hides from us a factor of far greater importance in the development of the human race and of life in all its varied forms: we mean the factor of *co-operation, union, and mutual help*.

To begin with plant life, we see here unmistakable evidence of combination to secure the development of the whole.

Roots, trunk, stalks, leaves and flowers, all work together in harmony. But this unity of purpose is carried a step further in the family of *Compositæ*, which comprises an immense number of species. The best-known representatives of these are the dahlia, daisy, aster, anthemis, chrysanthemum, sunflower, arnica, marigold, thistle, chicory, lettuce, salsify, scorzonera, sow-thistle, coltsfoot, etc.

The flowers of these plants were originally distributed all along the stem, but owing to their small dimensions they constantly ran the risk of being overlooked by winged insects. What did they do? Realising the fact that union is strength, they grouped themselves together at the highest point so as to form one large flower visible from afar. The flowers which were situated on the outer ring gave up their stamens to be converted into brightly coloured petals, so that their friends the

pollen-carriers might more easily be attracted to the whole group.

In truth, union and co-operation are being continually manifested in every living object. What is the human body, for example, but a huge "co-operative concern" in which each member works intelligently and untiringly for the general good?—brain, heart, lungs, gastric, pancreatic, hepatic, thyroid, salivary, sebaceous, and sudoriferous glands, suprarenal capsules, eyes, ears, tongue, legs, arms, hands, muscles, nerves, serum of the blood, red corpuscles, phagocytes, and skin.

With a view to greater efficiency, each separate part of the body, as we know, has undergone specialisation; but in order that the whole machine may work smoothly, or rather, in order that it may be able to work at all, constant co-operation and complete harmony are essential, so that each organ shall perform only such acts as are profitable to the whole community. And again, each of these organs is itself made up of various parts, more or less numerous, but all united in the furtherance of a single purpose: *the life of the whole*.

Sometimes the principle of co-operation may be pushed as far as actual substitution; that is to say, the place of a dead or diseased organ may be taken by a healthy one.

Thus, when one of the kidneys is injured or destroyed, the other will increase in size so as to do the work of its fellow, sometimes even becoming as heavy as the two put together.

But the classical instance is that of a large blood-vessel (vein or artery) which has been rendered useless by inflammation; in this case continuity of function is assured by the rapid enlargement of one of the neighbouring veins or arteries, often

hardly visible at first, to take the place of the one affected.

On occasion, too, the organs of the body will lighten each other's tasks during a period of stress. For example, when the heart is suddenly overtaxed, the blood-vessels dilate in order to allow the blood to circulate more freely, and in this way the heart is relieved of some of the work thrown upon it. As soon as the strain has ceased, the blood-vessels resume their normal dimensions.

Passing now from the animal body to the animals themselves, we find that intelligent and unselfish co-operation plays a most important part in the preservation of species. We will content ourselves with recalling what has been said with regard to bees, ants, monkeys, rooks, rabbits, chamois, wild ducks and geese, flamingoes, sea-gulls, prairie dogs, zebras, wild horses, beavers, otters, walruses, pelicans, crabs, crows, storks, etc. (See also *Mutual Aid*, by Kropotkin.)

The existence of co-operation in such measure among so many plants and animals cannot be due to chance. To us it appears evident that co-operation is willed by Nature, and that she makes constant use of it for the development of life.

Further, it cannot be denied that without such united action and mutual help, constantly rendered, life would never have been able to exist in other than unicellular beings. For directly you have a living thing composed of more than one cell and differentiated as to its parts, constant co-operation between all its cells and all its organs becomes the prime necessity of its existence. *Thus we see that co-operation is of infinitely greater importance for the development of life than competition.*

Through association with others, it is true, the

individual forgoes a certain amount of liberty, but on the other hand its power of living and its well-being are much increased. Uniting for the purpose of mutual aid is the surest means of guaranteeing the safety and the continued existence of all.

As regards kindness and sympathy, the most typical of the altruistic virtues, let us see in what esteem they are held by Nature.

Darwin was greatly astonished and perplexed, at the outset, by the phenomenon of the sexless or working bee. His whole theory, indeed, seemed to be shattered by the existence of these sterile members of the community, inasmuch as total sterility was an attribute that could in no wise be transmitted by heredity. How then was it possible, on the principle of natural selection and the survival of the fittest, to account for the presence of so many of these bees in every hive for thousands of years in the past ?

When Darwin saw that, on the principle of the division of labour, these sterile females devoting themselves exclusively to their work constituted a real asset for the hive, he was placed on the track of the important discovery that the law of selection applies not only to the individual but also to the community ; in other words, that the same rules of selection that govern the individual *qua* individual also govern any group of individuals *qua* group.

Man does not live an isolated life ; he is always a component part of some group, be it a tribe or a nation. Hence it is evident that the instincts, feelings, and customs which form the strongest bond of union between members of the same group or community are highly advantageous factors in the struggle for existence which this community will have to sustain.

It is no exaggeration to say that the sympathy and affection which the members of a group feel for one another are not only of advantage to the group in question, but even constitute one of the essential conditions of its existence. For "sympathy" is a feeling which links a man to his fellows and endows each member of a community with the strength of the community as a whole.

If there were one tribe the members of which were sympathetic in their attitude to each other, and another tribe in which each man's care was only for himself, there can be no doubt that natural selection would tend to the preservation of the former and bring about the extinction of the latter.

Let us hear Darwin on the subject. Speaking of remote ages when our savage ancestors were grouped together in families or small tribes, he says: "When two tribes of primeval man, living in the same country, came into competition, if (other circumstances being equal) the one tribe included a great number of courageous, sympathetic, and faithful members, who were always ready to warn each other of danger, to aid and defend each other, this tribe would succeed better and conquer the other. Such a tribe would then in the natural course of things spread and be victorious over others. If it should be itself in turn conquered, it could be only (other things being equal) by some tribe more richly endowed with these same moral and social qualities. And thus these qualities would tend slowly to advance and be diffused through the world."

Evidently, also, these same qualities must have been of great service to the tribe not only in its contests with neighbouring tribes but also in hunting and in fighting against wild beasts (especially in

primitive times when weapons were rude and imperfect), during periods of famine, floods, and so forth.

Natural selection, therefore, has led to the survival of those who in their dealings with one another showed most kindness and sympathy of a practical nature. Nor could it possibly be otherwise, seeing that these two qualities tend to develop and safeguard life itself.

Human morals, then, have passed through nearly the same phases or stages as those of animals. First of all came family morality.¹ Then wandering tribes appeared, and their ethical sense was that of the herd. Later, men established themselves in fixed abodes, and civic morality was born.

For a long time no further progress was made. All those who were not of the same city or clan were regarded as enemies, and when possible they were massacred without pity, the state of morality being exactly the same as that displayed by the Fuegians in 1830.

At last cities united, and the nation took shape. Duties were extended, not only to other families, but to other cities. Men now really began to rise above the level of animals: they possessed national morality. This national morality endured hundreds and hundreds of years. It taught people to help the members of the same nation, but to detest "foreigners," to consider them always as enemies, and if possible to destroy them. As has been well said by Voltaire: "To desire the greatness of one's own country was then nothing else but to wish ill to one's neighbours."

¹ According to some writers, it was the single family that formed the starting-point; others think that a number of families united at once to form a clan. This difference of opinion, however, is of small moment as far as our theory is concerned.

This morality is still that of most people. With some, however, the ethical sense has taken another forward step, national morality with them tending to expand and become cosmopolitan. They recognise that man owes duties towards the family, the city, the nation, and also towards humanity at large, without distinction of race or caste. Certainly we are right in saying that moral progress still continues. The dignity of human nature is more and more respected in others; we cause less and less suffering; tortures and slavery are not tolerated; criminals are no longer considered as merely dangerous beings against whom we must defend ourselves, but rather as patients whom we must try to cure; the poor and the sick are assisted in a more intelligent manner; the right of each individual to work, to air and light, to intellectual life, and to a certain degree of comfort has been recognised. Liberty of speech is allowed; the people by their representatives make their own laws; wealth and power offer less and less protection to the criminal against the just application of these laws. Justice is at last beginning to appear. Our sympathy is no longer limited to those who surround us, to those whom we can see with our own eyes, our own family, our own clan, the inhabitants of our own village: it is extended to the whole of mankind. The unity of nations for practical good is a dream which is tending to be realised.

Therefore we can say with J. Payot: "As life dates from the Silurian period, the laws of Nature have been what they are now for many millions of years. . . . On the other hand, this long evolution which has been going on for thousands and thousands of years has produced thinking

beings, and these thinking beings have developed into moral beings. Are we not then compelled to admit that the progress of things tends towards thought and morality? "

And with C. Richet: " Man's intelligence (and, we would add, his morality) represents the highest point reached by organic evolution. For thousands and thousands of centuries billions upon billions of beings have lived in order to lead up to this result."

This length of time has been necessary because everything in Nature is done slowly, and often along broken lines, with ups and downs, deviations and occasional set-backs—circumstances but rarely permitting a continual ascent, or uninterrupted progress in a straight line.

Nevertheless, it is clear enough from the facts already mentioned that *Nature always tends to produce life in its most active form, and that in the struggle for existence (whatever aspect it may assume) those beings are most favoured by the operation of Nature's laws who possess in the highest degree the greatest number of qualities both mental and moral.*

It may therefore be said that *the object pursued by Nature is not merely life, but life reaching the highest possible pitch of activity, morality, and intelligence*; in a word, the life that is in all respects most complete, due regard being had to time, circumstances, and environment.

* * *

By the persistence of life in spite of all obstacles is testified its will to live.

Every living cell, plant, or animal, every living being, merely by virtue of its being alive, wishes to

live fully and completely, and desires the expansion of its whole being.¹

If this desire for the preservation and the augmentation of life, for its expansion in the fullest sense and in every direction, is manifested perpetually and in all places, it is because it does not come from without but is inherent in substance, in the cell, in the organ, and in the entire being.

One sees it in the development of the germ ; in the ascending sap ; in the tree which clothes itself with blossoms ; in the egg, a homogeneous liquid which will nevertheless produce a complete bird, having brain, eyes, beak, tongue, bones, claws, wings, heart, lungs, blood, etc. ; in the growing child ; in lungs that breathe ; blood that circulates ; digestion that acts ; wounds that heal ; the whole body that fights against illness and destruction ; in adaptation to environment ; in intellectual development ; in the thirst for knowledge ; in the pleasure derived from movements and activity ; in the formation of friendships ; in love springing up in the heart ; in the æsthetic sense which gives us such sweet emotions ; in the sun which floods the Earth with its energy ; in the great life of our planet ; in life universal, for life is in very truth the *law* of the Universe.

Now, man is an integral part of the Universe. Man is a particle of the Whole ; what the Whole

¹ Even voluntary death is (except in cases of insanity) an unquestionable proof of the suicide's desire for the *complete* life. He prefers to disappear rather than continue to lead a stunted and diminished existence, or one that he considers as such. The ordinary cause of suicide, indeed, is some diminution or shrinkage in the mental, moral, or physical self, caused by a bereavement, by the loss of fortune or social standing, by the forfeiture of public esteem, or the deprivation of bodily health (as in the case of an incurable disease).

wills, the part must will also ; where the Whole goes, the part must go also ; what the Whole desires, the part must desire also.

A moral man ought therefore to act with the Universe, to tend in the same direction as the Universe, and the will of Nature will also be his own.

That is to say, he ought to desire to live, and to live a life which in all its aspects—physical, intellectual, moral, social, and æsthetic—ever tends to become broader, stronger, more intense, more beautiful, and more harmonious. His aim, like that of Nature, should always be the complete expansion, the harmonious development of all his being, the continual enlargement of his life.

What is meant by the enlargement of life ? To enlarge life is to act more and better, to work more and better, to produce more and better, to feel more and better, to understand more and better, to love more and better, to aid our fellows more and better.

Life, then, being the criterion of Good and Evil, Natural Ethics may be defined as the science which has for its object all means of conserving and augmenting life in all its aspects (physical, intellectual, moral, social, and æsthetic), and thus realising the full development of the whole being.¹

And to the question with which we started : “ What is Good and what is Evil ? ” we are now able to reply :—“ *The Good is everything that contributes to the conservation and the enlargement of life—that is to say, to the full development of our physical, intellectual, moral, social, and æsthetic faculties, to the normal exercise of all our activities. Or, more simply, the Good is everything that contri-*

¹ Guyau's formula slightly modified.

butes to the harmonious expansion of the individual and of the groups of which he is a member.

At the same time, it should be borne in mind that the normal exercise of all our activities can be fully achieved only by means of union, co-operation, mutual help, and practical sympathy towards all living things, and by the active, never-failing desire to contribute as much as possible to the greatest expansion of the greatest number, which means that the individual will, when necessary, sacrifice himself of his own accord in the interests of the group.

Inversely, it may be said that Evil is everything that diminishes life to no purpose, everything that unnecessarily hinders this full development and harmonious expansion of the individual and of the groups, the only rightful exceptions to this rule (which must always be taken scrupulously into account) being such as are necessitated by the normal development of other individuals and other groups."

* * *

It may be asserted, then, that the morality of an act stands in direct ratio to its tendency to preserve, enlarge, and harmoniously develop the life of the individual or group of individuals, and that the morality of a man depends on the number of such acts performed by him. At the same time we shall not forget that the effort to improve the *quality* of life ought to take precedence of any improvement in *quantity*, because there are circumstances in which we ought to run the risk of death, or at any rate the possible curtailment of our existence, in order to fulfil what we consider to be our duty towards the group to which we belong; for instance, rescuing people who are in danger, or nursing those who are suffering from an infectious

disease. We have always to subordinate the "more" to the "better," else we are apt to be merely restless and ineffectual.

Every being, therefore, that strives to impart the fullest possible development to his own life and to the lives of others, is a moral being.

It necessarily follows that, in this sense, plants are moral, inasmuch as they work steadily, though perhaps unconsciously, to attain their full development, and, as we have pointed out, do all they can to safeguard the lives of their offspring.

The same is true of animals, though no doubt they act less unconsciously.

For an action to be moral, it is not necessary that it should be done after mature deliberation, a careful weighing of the pros and cons, and with a full realisation of the advantages or dangers entailed by it. So far from that being so, an action may very well be moral and yet instinctive and unpremeditated. The mother who instinctively and without reflection exposes herself to danger in order to save her child, performs a moral act, no matter whether she be a woman protecting her infant from a murderer or a cat impelled by the same motive to rush at a dog ten times her own size.

Nor is it essential that an act, in order to be moral, should be "hard of accomplishment and grievous to the heart." A whole host of pleasurable acts are moral: an excursion in the country to "set oneself up" after a good bout of honest work, a game of tennis to keep our limbs supple, showing a smiling face in order to cheer up those around us, etc.

* * *

The definition of Good that we have given above applies not only to every individual but also to

every group of individuals. Taking our own body as an illustration, we see that this definition is valid in the first place for each of our cells; secondly, for each of our organs, which are nothing but an assemblage of cells; and lastly, for the whole body, composed as it is of these same organs acting in unison.

The same holds good for any collection of individuals, whether it be a natural group, such as the family, or the result of a long series of historical events (a nation), or an entirely artificial group (one of the numerous leagues or associations for political, philanthropic, scientific, or literary purposes). For the individual as for every sort of group, ranging from a single family to the whole of the human race, the Good will be anything that helps to further its development, its harmonious expansion, the exercise of all its activities, and the enlargement of its life.

This system of ethics, then, is universal in its application.¹

The outline of an ethical system based on the laws of Nature would not be complete unless we made some few remarks on a question which

¹ As soon as our legislators are convinced of the truth of this definition of Good, they will understand that all laws should have only two objects: (1) to foster the growth and expansion of the individual, and also to ensure the proper working of all institutions and associations which help to further this expansion; (2) to suppress anything that is likely to hinder the complete development of the individual or of the group to which he belongs. In other words, the object of laws should be to enable each individual and each group to develop to their fullest extent, unimpeded by any restrictions other than those necessarily arising from the normal development of other individuals or groups. Moreover, since man is too feeble and the sport of too many contingencies to stand alone, the legislator will make it his endeavour to promote the feeling of solidarity and to encourage every form of co-operation.

is as old as the world itself: the [question of happiness.

Happiness is not unusually supposed to be the object of life, and when we are not so happy as we think that we have a right to be (for it is assumed to be a right) we groan and exclaim against Providence, find fault with Nature, and pose as the victims of destiny. This is due to our confusing the end with the means.

Let us suppose two countries to be at war. Each of them, wishing to get the better of its antagonist, devises all sorts of means by which its soldiers and officers may be induced to exert themselves to the utmost: mention in despatches, service medals, promotion, pensions, etc. Now, the idea that happiness is the object of life is much the same thing as thinking that the winning of a medal is the sole object of war; or, in other words, that a country only goes to war in order that it may bestow decorations on a certain number of officers. As a matter of fact, war as normally waged by a nation is either an offensive war, for the sake of securing certain advantages which she thinks, rightly or wrongly (generally the latter), will aid in her development and enable her to enjoy a larger life; or a defensive war for the preservation of her independence—that is, to enable her to continue her development unchecked, and to live her own life. And in both cases, mention in despatches, promotion, and distribution of medals are only so many means to bring about the desired end.

Nature acts in a similar manner. Since the object of life lies within itself, being in fact a life ever fuller and more complete, Nature, in order to stimulate us to do our utmost in this direction, rewards each of our efforts by giving us a pro-

portionate feeling of pleasure. We can truly say that any act which tends to increase the fullness of our life gives us pleasure, for pleasure (or happiness) is nothing else but the sensation or consciousness of a more vigorous, active, and harmonious existence.

Thus, we experience the purely physical pleasure or satisfaction of eating and drinking (actions which are essential to life), or, when we are children, of running, jumping, and shouting (forms of activity necessary for the development of the bodily organs) ; later on, the intellectual and æsthetic pleasures of friendly intercourse, of beholding fine works of art or listening to beautiful music ; of travelling, acquiring information, and exerting influence on others. There is the intimate pleasure which comes simply from living and doing ; or again, the more specific pleasure which springs from requited love ; and lastly, the greatest pleasure of all, which is the reward of those rarely gifted souls who unselfishly sacrifice themselves for the good of others : the man who rushes to the rescue of women and children in a burning house ; the nurse and the physician who unreservedly lavish their skill and devotion on patients suffering from infectious diseases ; the statesman who strives in a good cause in spite of insult and calumny ; or the man of science who devotes all his time and thought to the quest of truth ;—in a word, all those who work, fight, or suffer in order to ameliorate the sum total of human life. These pleasures are really, in every case, the means which Nature employs in order to lead us in the way she desires, namely, towards an increase in the intensity of our own life or of the life of the Whole.

In making happiness our immediate aim, then,

we are going the wrong way to work, and it eludes us ; on the other hand, if we endeavour to increase, in ourselves and in the greater or lesser groups to which we belong, the quantity, and above all the quality, of life, we shall assuredly taste pleasures of a profoundly sweet and satisfying nature—pleasures which seem to be lasting because they are so constantly renewed.

Perhaps it will be said that this is only a quibble, and that as a matter of fact we are all making for the same goal of happiness, though by different roads. It may be so. But it seems to us that he who acts with the sole object of being happy has attained neither the intellectual stature nor the moral dignity of one who, attaching only a secondary value to the happiness which may result from his efforts, brings development and harmony into his life from a sense of duty not only towards himself but also towards the Whole of which he is part and parcel.

Moreover, it is clear that in many cases our actions will differ accordingly as we make happiness the direct object of our search, or try, as we have said, to increase the quantity, and more particularly to enhance the quality, of life that is in us and around us. Such differences are observable even in the most ordinary affairs of life, as for instance in the performance of a tedious and monotonous piece of work. Is it not highly probable that one who only seeks his own happiness will do the work in a petulant spirit, and with many groans and complaints ? And the completed task, done as it is in haste in order that it may be got rid of as soon as possible, will do no credit to its author, who will feel dissatisfied with himself in consequence.

Another type of man, whose first concern is the

harmonious development of his nature, will perform his task, however uninteresting it may be in itself, with cheerful placidity, knowing as he does that all work—everything that requires an effort—tends to develop precious qualities in the person who does it with zest and intelligence, ever striving to bring it to greater perfection.

Is it not also a fact that the seeker after happiness easily yields to a certain form of egoism (refined egoism, it may be, but egoism for all that) which leads a man to do good not for the love of it but in order that he may be spared the depressing sight of another's pain?—for the seeker after happiness always makes self his guiding principle.

Egoism of this kind is responsible for that peculiar type of wife who, so the story goes, refused to tend her husband during a serious illness on the plea that the sight of his suffering would be too painful to one who loved him as she did ; and who, in order to avoid this " pain," spent the day at the house of a friend, where she knew that the most agreeable attentions would be showered on her.

Lastly, those who live for the pursuit of happiness, despite all their precautions, soon reach the point at which they confuse happiness with pleasures or enjoyment, very often with disastrous consequences for themselves and for others.

* * *

We may add that our individual life can never possess its full value and intensity unless the group to which we belong has itself attained a certain degree of development.

It is not easy, for instance, to imagine a Darwin, a Shakespeare, a Pasteur, a Goethe, or a Leonardo da Vinci being born and bringing their genius to

full maturity among the aborigines of Tierra del Fuego or any other uncivilised tribe.

The intensity of our individual life, therefore, and the number of our activities as well as our pleasures will increase in proportion to the completeness with which our environment has been developed.

And inasmuch as the expansion of our nature and the happiness resulting therefrom depend very largely on our environment, we can assert that it is to our interest to further by all means in our power the harmony and development of this environment, which is nothing else than the community in which we live.

Thus we see that our ethical system based on the Laws of Nature satisfies the two primary instincts of man, the egoistic and the altruistic, since it urges us to help in the expansion and enlargement of other people's lives in order that we may be able to expand and enlarge our own life in like manner.

* * *

The cult of Life, then, interpreted in the right sense, will be a sufficient index for the correctness of our conduct both in public and in private, and consequently it will be able to give us all the pleasures or all the happiness that is agreeable to our natural constitution.

Anyone who may be inclined to cast doubt on this assertion need only put our system into practice for a certain time, by way of experiment; and if the trial is made in good faith, the result will be conclusive. In truth, such an experiment is within everybody's power, for the duties enjoined by this moral code are easy to understand and easy to carry out.

All the standard rules of health, for example, will be adopted, since they tend to the preservation and development of life. We shall take plenty of exercise in the open air, we shall perform copious ablutions, we shall avoid alcohol in any form whatsoever, and always be on our guard against excess of every description.

We shall also be alive to the importance of labour, both physical and mental, for the development of brain and body adds to the intensity and value of our life. Work will no longer appear in the light of a punishment inflicted by an angry God on man, but rather as a privilege and an honour which everyone should be anxious to claim. And, indeed, what is it but a privilege and an honour to be able by our own efforts to perfect and embellish the life which is in us?

We shall not allow ourselves to forget the extremely important part played by kindness in the unfolding of our own nature and that of others. It is by kindness that we alleviate the sorrows and misfortunes of our fellows, mitigate or even prevent causes of offence amongst those with whom we live, soothe and encourage them, and bring them back to the way in which they ought to go. All this helps to promote the development of life.

In fine, by the wise diffusion of an atmosphere of kindness we win the hearts and minds of men, so that, as the number of persons having trust in us increases, our power for good will increase as well.

But in order that the quality of kindness may lose none of its value, it must be full of activity, sympathy, and insight; it must be attentive, patient, helpful in counsel, and lovable, yet at the same time firm and prudent. It must be guided

by a sense of justice, so that in benefiting one it may not be hurtful to another. Lastly—and this applies particularly to maternal kindness—it will be even more concerned for the future than for the present, and will refuse to sacrifice prospective happiness for the sake of immediate enjoyment lasting but a few moments.

Still taking Life as our guide, we shall also realise the necessity of developing firmness of will, courage, attentiveness, patience, perseverance in our efforts, self-respect, and sympathy for all living things. We shall understand that there must be in our hearts a passionate love of truth and justice, and that we must always be ready to sacrifice everything unflinchingly for their sake.

We shall be thoroughly aware of the scope and importance of solidarity, that scheme of mutual interdependence from which we can never escape, and which, with or without our knowledge, exercises its influence for good or evil on us all.

We shall bear in mind that every action performed by us, whether good or bad, not only has its effect on our own nature, physical, mental, and moral, but also reacts directly or indirectly on others.

We shall feel very strongly that this expansion of the entire self which is the aim of life can only be achieved by mutual aid, union, and co-operation. It will be quite plain to us that one who lives solely for himself is unable to find scope for all his activities, "for it is the peculiarity of egoism that it narrows the range of thought, limits our aspirations, and, by seeking to impose restrictions on life in the interests of a single person, diminishes instead of enlarging it." For the enlargement of life, as we have already said, involves above all an increase in the amount and the intensity of loving and doing.

Being aware that the Laws of Nature—that is to say, the unvarying succession of phenomena—are the outward expression of a principle of necessity inherent in the constitution of things, we shall understand that they cannot be other than they are. So far from complaining at times of their being unjust, we shall on the contrary admire their justice and their constancy, seeing that they always act in the same direction and always pursue the same goal, never allowing themselves to be turned aside or impeded in their course. Being convinced that a given act is invariably followed by the same effect or phenomenon, we shall see to it that all our voluntary acts are such as will be followed by effects favourable to the harmonious development and expansion of life, and we shall carefully refrain from the commission of acts resulting in phenomena that might be injurious to this expansion in ourselves or in others.

And our obedience to these commands which are formulated by life itself will be thoroughly sincere, for in the depths of our inner self there will be the conviction, ever growing stronger, that in the vital instinct alone, and nowhere beside, can true morality find a firm and unshakable foundation.

Against arbitrary commandments, imposed from without, we might rebel, but the commandments of life itself, the life that is in our veins, we shall accept as something natural and logical and good.

Part II

Complement to the Theory in the form of Answers to Objections

Objection :—" Since Nature's desire is for life, why should there be death ? "

Answer :—Nature requires death precisely because she always wants more life. The energy of the body is gradually exhausted—it is impossible that it should not exhaust itself,—organs become worn out—it is impossible that they should not wear out,—and a time comes when the aged are happy to have finished their task, and when they long for rest. Nature does not tolerate inertia, non-activity. What she requires is work under all its forms. The aged and the infirm die because they have done with activity. They must make room for young people who are stronger, more energetic, more capable of work, more zealous, more enthusiastic. Life can only exist when it is continually renewed. The forms assumed by life are only transitory, but the aim which Nature pursues is undoubtedly life, for she dispenses it lavishly everywhere, and even engenders it from death itself, only re-absorbing her atoms and electrons in order to build them up again into new bodies and new combinations.

Finally, let it be noted that death is not cruel to the dying, but only to those who see their loved

ones taken from them. (For a fuller treatment of the subject of death, see Part IV.)

* * *

Objection :—" If Nature passionately loves life, why should there be tempests, cyclones, earthquakes, etc., which spread disorder, terror, and death ? "

Answer :—Listen to Louis Bourdeau : " In all calamities (tempests, volcanic eruptions, meteorological irregularities, etc.) which cause us to lament, we ought to see . . . the normal activity of a world which carries out its cosmic functions. These accidents which we call disorders are, on the contrary, a part of its order . . . and since we benefit by this order through the conditions favourable to life which it creates for us, we ought uncomplainingly to put up with the detrimental side of its activity. . . . There is no confusion, except partially and in detail. Harmony reigns in the whole because it performs its evolution with regularity, securing to the series of beings that are incorporated in its unity an environment favourable to their development."

The Laws of Nature being what they are (and they cannot be otherwise, since they are the manifestation of a necessity inherent in the constitution of things), such calamities are bound to occur.

There were only two possible alternatives : either a world devoid of life and eternally inactive, in which no development is possible ; or a living world full of motion and activity, but subject to occasional catastrophes. Without these catastrophes, indeed, the life that quickens all the earth could not continue, and death would reign no longer partially but completely over the surface of our globe ; or rather, it would not be death but non-existence,

for nothing would ever have lived. Here again we find Nature destroying in order to increase the sum of life.

* * *

Objection :—" Nature is unjust, because she often allows the good to perish in shipwrecks, railway accidents, earthquakes, and epidemics, while many wicked people survive. It frequently happens, too, that persons who are highly virtuous and deserving of happiness come to grief in their undertakings."

Answer :—For the sake of clearness, we will deal separately with each of the five cases here put forward.

We will suppose, then, that a ship founders in a storm at sea. In the first place, let it be observed that the force of the hurricane, as well as the path which it follows, are determined by fixed laws. The atmospheric conditions which gave rise to the squall were the result of previous conditions, and these in their turn had been caused by others still more remote, and so on indefinitely—all in obedience to the unalterable laws without which our earth would be a mere conglomeration of matter quite devoid of life.

It follows, then, that in order to alter the path of the storm or the time of its bursting, or merely to mitigate its violence, Nature would have had to suspend or modify a multitude of laws (probably even those that determine the size and the number of sun-spots) ; or, in other words, Nature would have been obliged to shatter the whole cosmic order, for all phenomena are so closely connected that the slightest change in any one of them would doubtless result in universal chaos and the destruction of all living things, unless indeed the modification was introduced slowly enough—extending

over millions of years—to enable life to adapt itself gradually to the environment brought about by these new laws or this new sequence of phenomena.

Being the result, then, of a whole host of causes and effects, the storm was absolutely bound to begin at one particular spot, follow such and such a path, and attain a certain degree of intensity. A certain part of the ocean must necessarily, therefore, be the scene of a hurricane; and if a ship of small tonnage or faulty construction, or one that is either overloaded or underloaded, or too old, or unskilfully handled, happens to be within this area, a shipwreck may very well be the outcome; and the passengers that are saved will not necessarily be those that are most virtuous or most useful to the human race, but in all probability those who—whether they be criminals or no—are the most expert swimmers, or are wearing some kind of life-saving apparatus, or who succeed in getting a place in one of the lifeboats.

There is really no connection at all between “being virtuous” and “wearing a life-belt.” The man of virtue obeys certain moral laws, and is rewarded by a feeling of great inward satisfaction; the wearer of a life-belt obeys the laws of hydrostatics, and is rewarded by being kept above the surface of the water.

Because a man obeys moral laws it does not follow that he can set physical laws at defiance.

Nature rewards him who, in a certain situation, obeys the laws relating to that situation, and punishes him if he does not obey them, whatever the reasons may be that prevent him from doing so. Were she to act otherwise, there would be nothing but chaos, anarchy, and disorder.

Let us now turn to the railway accident. An accident of this kind may be due either to the carelessness of the engine-driver or the pointsman, or to the negligence of those whose duty it is to inspect the line or the rolling stock, or lastly, perhaps, to heavy rains which have soaked through the permanent way and caused it to collapse.

All these causes except the last are attributable to human agency, and are therefore excluded from the terms and scope of the objection. There remains only the accident caused by the rains. But what we have just said about storms is equally applicable to rain. In order to prevent rain from falling in a given quantity on such and such a day and on some particular spot, it would have been necessary to interfere with the working of natural laws, and any such upsetting of the order of the universe would have given rise to catastrophes far more frightful than any railway accident, however shocking the latter may be.

If the infiltration of water, then, or the collapse of the permanent way, is not noticed by the company's engineer, the accident will occur, and any man, be he virtuous or criminal, who happens to be in the place of danger will doubtless perish. If he is crushed to death, it will not be because he is a good man or a bad man, but simply because—through a lengthy chain of circumstances—he happened to be “on the spot,” and being a living creature, composed of flesh and bones, was unable to withstand so violent a shock without fatal injury.

With regard to earthquakes, they are caused by some local subsidence, or by volcanic activity, or by a sudden rupture due to the straining and squeezing of the earth's crust—all of them move-

ments which are bound up with the "life" of our planet. And, just as in the case of the railway accident, any man, irrespective of what his virtues may be, will perish if a "chain of circumstances" should have brought him to the scene of the disaster.

The fourth objection has reference to epidemics. Now, the appearance of an epidemic, it goes without saying, is only due to our own ignorance or indifference, both leading to the neglect of precautions required by the laws of health.

So much having been premised, let us see why it is that one man will shake off his illness without much trouble, while another will not recover from it.

Epidemics are caused by pathogenetic bacilli; and the serum of our blood and the phagocytes whose function it is to counteract or destroy their toxins will do their work with greater or less effectiveness according to the nature of our ancestry and the care with which we ourselves have observed the rules of health.

If, by reason of their infraction of biological laws, a man's ancestors have bequeathed to him certain physical defects resulting in an inferior quality of serum or in the sluggishness of his phagocytes, or if he himself has transgressed so seriously and frequently as to weaken his power of resistance, it is highly probable that he will find himself beaten in the struggle for life, even if he is good and generous by disposition, or the only child of an adoring mother. If, on the other hand, the physiological qualities that his ancestors have transmitted to him are such as to ensure the excellence of his serum and the vigorous activity of his phagocytes, if he has scrupulously avoided excess and observed the laws of health in every detail, he will probably succeed

in extricating himself, even though his moral character may not be particularly commendable.

Thus it is neither a good man nor a bad man as such who falls a victim to these bacilli, but simply one who, through his own fault or that of his ancestors, is incapable of resisting their attacks.

Lastly—and this is our reply to the fifth objection—let us remember that if we wish to succeed in our undertakings, we must observe the laws that apply to each particular case. It does not necessarily follow, for example, that a man will succeed in his business affairs because he is a devoted son and an admirable father, or has a fellow-feeling for the misfortunes of others, if at the same time he is incompetent, makes use of defective plant, is remiss in his attendance at the works or at the office, or, in a word, does not put all his brains and energy into his business.

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Objection :—"What is the object of heredity? Why should we suffer for the sins of our ancestors? Why should the tendency to disease be transmitted? Why does Nature allow heredity in things evil? Why is it not confined to good and virtuous qualities; and why are physical, mental, and moral imperfections not personal and intransmissible?"

Answer :—The general law of heredity may be briefly stated as follows: "Like tends to produce like, though subject to variations which are due to the diverse and multiplex influences of more or less remote ancestors, as well as to environment and the particular circumstances of each case."

Stability is ensured by the first part of this law (like produces like), but for which all would be disorder, confusion, and chaos. It is owing to this principle that oak springs from oak and violet from

violet, that elephant begets elephant and partridge begets partridge.

By the second part of the law (stating that this uniformity is modified through the influence of ancestors more or less remote as well as by circumstances and environment) innumerable variations are made possible.

Now, the importance of variation is indisputable. Those variations that are useful to the individual or the species will persist, and evolution will be carried a step further; those, on the other hand, that are harmful will bring about the disappearance of the individuals in whom they are exhibited, or of their descendants.

The first part of this law, then, ensures order and stability, while the second part ensures progress, development of the race, and adaptation to environment. Thus, heredity is necessary to the general good, and that is a sufficient reason for its existence.

As for explaining why we suffer for the faults committed by our ancestors, why the tendency to disease is transmitted, and why heredity is not confined to good and virtuous qualities, it will suffice to say that, as a general rule, heredity operates *en bloc*, and that we inherit both virtues and vices, qualities and defects—in a word, all the tendencies, for good as well as for evil, of our forefathers.

And that is something which cannot be otherwise than it is. In order to make a selection among the whole number of different tendencies, so as to hand down only the good and not the bad, Nature would have to be performing a perpetual miracle—an impossible feat. Every other moment she would be obliged to suspend the working of the primordial

law, "like engenders like," a law which ensures the stability and continuity of life. The universe is bound together by necessary laws—laws, that is to say, which ensure the existence of the whole and the development of the individual. Now, this twofold object is secured by the two parts of the law of heredity acting in unison. Like engenders like, hence Nature cannot produce an oak tree from mignonette seed ; and for the same reason she cannot cause a man of intelligence and discretion, well balanced and fond of work, to be born of imbecile parents (individuals suffering from cerebral lesions).

In cases, however, where bodily, mental, or moral health is too greatly disturbed by vices of any description, the race dies out, and consequently these vices are no longer transmitted. Such is the case with drunkards, whose posterity are doomed to extinction in the second or third generation unless there is a reaction and a strict observance of the laws of health on the part of the descendants.

It is for us, then, to fight against evil tendencies that hinder the full development of life, and to take the steps required to increase our bodily, intellectual, and moral strength. Many succeed in this attempt. Many who were brought into the world with a pronounced tendency to one disease or another have managed, without undue pain and trouble, and thanks to an intelligent system of hygiene, to exceed the tale of years normally allotted to man.

In conclusion, it may be said that the law of heredity, which in a general way ensures the transmission of good and evil tendencies, is only a particular instance of the still more comprehensive law of solidarity.

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Objection :—"Nature is cruel, because she makes even animals suffer."

Answer :—It is true we often find ourselves pitying the fate of certain animals that are surrounded by enemies and must therefore, as we imagine, live in a continual state of alarm while they await the fatal moment when a tragic death will put an end to their manifold terrors. We picture to ourselves a final struggle in which some wild beast, a lion or a tiger, will crush the bones and rend the flesh of the unhappy victim with its formidable teeth and claws.

Let us test the truth of this picture, taking the lion as our example.

To begin with, it may be safely asserted that no struggle takes place. The lion springs on his prey and breaks its neck or its back with a single blow of his mighty paw. This is done with the rapidity of lightning, and we may say without exaggeration that the peacefully browsing animal has ceased to live before it is aware of its danger.¹ Furthermore, even if the victim is not killed on the spot, it will certainly feel neither pain nor fear. In reply to this assertion it may be said that we are not sufficiently acquainted with the mental processes of the herbivora to know what their sensations are at that moment, and that our

¹ We shall be asked : "How about the cat which plays with a mouse before killing it?" The best way to study animals is to observe them in their wild state. The cat is well fed and therefore in no hurry to devour its prey, whereas lions and tigers only start on the prowl when they begin to feel the pangs of hunger. Hence they waste no time in playing with the victim which patience and exertion have brought into their clutches. Should they do so, however (as is sometimes the case when a lesson in the art of hunting has to be given to their cubs), the victim is still free from suffering, as we shall see a few lines further on.

statements are consequently of no value. We cannot, it is true, transport ourselves into the mind of the victim, but we know from trustworthy sources what the sensations of a human being are under similar circumstances.

And if no pain or terror is felt by a civilised man, whose nerves are extremely sensitive, when situated as Livingstone was, for example, we can surely assume that any kind of animal must also, at such a moment, be quite insensible to fear and pain. These are Livingstone's own words: ". . . I heard a shout, and looking half round, I saw the lion in the act of springing upon me. He caught me by the shoulder, and we both came to the ground together. Growling horribly, he shook me as a terrier dog does a rat. The shock produced a stupor similar to that which seems to be felt by a mouse after the first grip of the cat. It caused a sort of dreaminess, in which there was no sense of pain nor feeling of terror, though I was quite conscious of all that was happening. . . . This peculiar state is probably produced in all animals killed by the carnivora." (*Missionary Travels and Researches in South Africa.*)

Mr J. Hirst in his pamphlet *Is Nature Cruel?* (Clark & Co., London) gives a list of sixty-six cases in which persons have been mauled by lions, tigers, leopards, and bears. Out of these sixty-six persons, *only one* was afraid, and *only two* (for reasons explained in the footnote ¹) had any sensation of pain

¹ Only one of the victims (a tamer employed in Carl Hagenbeck's menagerie) stated that he experienced a sense of fear when attacked by the lion whose cage he had entered. And, moreover, this feeling did not manifest itself at the outset, but only when he was grappling with the animal for the second and third time. Two others said that they had a feeling of pain. But it should be observed that in one of these cases the female leopard

during their desperate encounter ; as for the other sixty-three, on their own repeated testimony, strange though it may appear, they felt neither pain nor alarm while the brute was crushing their bones or burying his teeth and claws in their flesh.

In these and other similar cases, the wound only becomes painful some time after it has been inflicted.

We appeal to the experience of all big-game hunters : those of them who have ever been mauled by powerful brutes will assuredly confirm our statement. It follows that if death supervenes during the encounter, as generally happens when the victim is an herbivorous animal, it must come without suffering.

Let us note, by the way, that the claws and teeth of flesh-eating beasts are constructed in such a way that it is practically impossible for their prey, once caught, to get away again. This is all to the good, for a wounded animal might suffer long and to no purpose.

What we have just said applies to all carnivora without distinction of size. In every case the death they inflict is swift and sure, because they are careful only to attack animals which cannot offer any serious resistance. Thus the weasel, for

which inflicted the injury was so enfeebled by loss of blood that she was unable to attack as vigorously as she would have done had she been unwounded. A wound is only painful when inflicted slowly. In the second case, the hunter was thrown off his feet by a tigress and rolled down a gully. He was bitten in the back of his neck, but not mortally, as the tigress was disconcerted by his tumbling down the slope. This animal was also very old, and relatively weak in consequence. Old lions and tigers are conscious of their infirmity, and therefore, unless they are brought to bay, they only attack victims that they can easily kill : sheep, lambs, children, or unarmed Hindoos.

example, preys on moles, rabbits, small birds, and poultry, and the owl on rats and field-mice.

It may be confidently asserted, then, that when one animal falls a prey to another, its death is unattended by suffering. And, indeed, we might have guessed as much, seeing that Nature never inflicts more than the necessary minimum of pain. A hunted animal is possessed with fear to the end that it may make an effort to escape ; but as soon as it has been caught and death is inevitable, fear ceases because it serves no further purpose.

It has been well said by A. Fouillée that " the development of particular sensations out of an enormous number of possible ones is biological in its origin and governed by a biological law : usefulness for the purposes of life." To this we may add that when a sensation (fear in the present case) ceases to be useful for the purposes of life, it disappears.

Again, we may say that, in general, as there is no knowledge of what is going to take place, anticipatory fears do not exist ; for, with the exception of wolves, the carnivora wait in hiding-places or follow their victims stealthily, taking care not to startle them, for fear they should run away, and only showing themselves when they can reach their prey at a single bound.

Consequently, we must not imagine that animals are in a constant state of terror at the " thought " of the danger they are running or have run.

Mr Roosevelt, the ex-President of the United States, in one of the letters he wrote to the *London Daily Telegraph* during his hunting expeditions in Africa in 1910, expressed astonishment at the rapidity with which animals forget the danger which has just threatened them. He was surprised

to see that zebras, etc., began to graze again the very minute the danger was over, and that two males resumed their fight immediately after they had run away from a lion which had killed one of the herd to which they themselves belonged.

Here is another observed fact :—Birds of prey of the falcon species are very numerous in the tropics. It often happens, when the sun is just about to set, that a falcon settles on the branch of a tree where a number of small birds are singing happily. After keeping quite still for some time so as not to give the alarm, the hungry robber pounces upon one of the songsters and carries it off. The unlucky bird's companions flee in all directions and for a few moments show every sign of terror. But very soon they flock together again and resume not only their songs and their twittering, but even the little quarrels that break out from time to time. The life of the survivors starts afresh, or rather goes on as before, just as though nothing unusual had happened.

In the *Journal of the Bombay Natural History Society*, vol. vi., Mr J. D. Inverarity tells us that one day in Somaliland he tethered a donkey to a large stone fixed in the ground, meaning it to serve as bait for a lion he wanted to entice to the spot. The lion came—but at a moment when the hunter happened to be absent ; it clawed the donkey, and then, being disturbed, made off. Yet only a few minutes after its visit the donkey was found quietly grazing.

In Allanson Picton's *Religion of the Universe* our attention is drawn to a somewhat similar fact. The author says : “ A familiar sight in mountain pastures helps to confirm our consolatory faith. For there, a lean and scraggy but active sheep will

occasionally be chased by a strange dog, and will fly for its life with every sign of consternation. Inferior to its pursuer in fleetness, it makes for rough crags which habit suggests as a place of safety. But the dog has not the least objection to stone or crag, and springs from ledge to ledge even more lightly than the apparently desperate sheep. At last, in seeming distraction, the pursued animal fails in its spring, and rolls down a short, smooth slope of rock on to a cushion of greensward below. A whistle is heard, the dog desists from the chase; and when you look to see the hunted, terrified creature lying in a breathless swoon, you observe it standing with its nose in the grass and munching the herbage placidly as though nothing had happened. There has been no interval for panting recovery, for soothing of shattered nerves, or revival of appetite. But the moment the dog turned away, down went the mouth into the herbage, and the delight of eating was resumed. In such a case, of course, it is undeniable that there must have been some fear and some arduous struggle to escape. But to exaggerate this into the sort of mental pain and exhaustion of nerve which human beings suffer through terror is absurd."

The animal, then, feels only the minimum of fear, and that for no longer than is absolutely necessary in order that it may be able to reach a place of safety, when such is available.

Again, we are told that animals, and more especially birds, suffer so much from cold during severe winters that they often perish. But freezing to death, as all travellers know who have experienced very low temperatures, is of all forms of death one of the least painful. One is irresistibly overcome by a deep slumber, and unless help arrives

promptly, the sleeper wakes no more and dies without pain, without even being conscious of his fate. The same is true of birds.

* * *

We must not forget to say a few words about pain in relation to insects. Readers of the works of J. H. Fabre, for example, must have been struck by the fact that the males are frequently killed by the females at the close of the pairing season.

Having placed twenty male and five female golden beetles in his "aviary," Fabre saw the whole number of males disappear within six weeks. The females had deliberately eaten their mates. But the remarkable part is that the males had not retaliated nor defended themselves by returning bite for bite, although, as Fabre very truly observes, their strength would have enabled them to fight a battle which might have turned in their favour; instead of this, the foolish creatures had allowed themselves to be devoured with impunity! In all cases of this kind, it seems as if some invincible repugnance prevents the males from offering any resistance. This incomprehensible degree of tolerance recalls the scorpion of the Languedoc, who, after the consummation of his nuptials, allows himself to be eaten up by his worthy partner without having recourse to the deadly sting which could easily dispose of her. We are also reminded of the praying-mantis, which is sometimes devoured piecemeal. The female mantis quietly nibbles away at her spouse, beginning with his head, whilst the latter continues to give proof of his affection, as if nothing were happening, until at last he dies, a mere headless trunk.

The above affords certain proof that insects are

not constructed on the same plan as vertebrates, and that there are times when the male insect becomes insensible to pain. The best confirmation of this view lies in the fact that the male could escape if he wished, at any rate at the beginning of the attack. In any case he might defend himself and make a fight of it; were he suffering, he would certainly do so, if only by the force of reflex action. But as it is, he calmly lets himself be eaten as though it were to him a matter of perfect indifference; and, if we may judge of sensations by the actions they evoke, we must admit that this is really the truth, and that here again, whatever the appearances may be, no pain is actually felt.

But how is it, some one may ask, that the males never try to devour the females? Simply because it is essential that the females should live in order to mature their eggs and find a suitable place in which to deposit them. In certain species, the mother even has to build or excavate a nursery large enough for her babies to live in with comfort. The dwelling must also be stored with a particular kind of food which has to be fetched from a distance. All this requires time. If the mother were killed, then, immediately after her union, the race would infallibly die out, whereas it is Nature's fundamental axiom that every species shall do its utmost to continue its own existence.

The males, on the contrary, being of no further use when once they have transmitted the vital spark, may well be allowed to die, and this they do without suffering.

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On the whole, then, very little physical pain is felt by animals; they only suffer when brought under the yoke of man: draught-horses subjected

to the whip and badly fed, animals conveyed to the slaughter-house, when the weather is very hot, in trucks where they can get nothing to drink ; poultry packed so tightly in baskets that they can hardly move (on market days the poor things are cooped up thus for hours at a time without food or water) ; game of all sorts with wounds inflicted by sportsmen enjoying the pleasures (!) of the chase ;—birds or quadrupeds, these wretched creatures before they die often linger on for days in an out-of-the-way corner of the field or forest, with lacerated flesh and tormented by the terrible thirst that is caused by severe wounds. (Do hunters or sportsmen ever give a thought to this suffering ?)

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It may also be asked if “ mental pain ” is not experienced by non-domesticated animals.

In the first place, we can state positively that they do not suffer by anticipation. They are not troubled, for instance, by the thought of death, nor do they create for themselves imaginary ills. They have no dread of sickness, and suffer very few disappointments, for they only desire things that they can easily obtain. Unlike so many human beings, they are never afraid of being reduced to destitution by want of employment, or of seeing their savings swallowed up in some financial disaster. Thus they are free from all anxiety.

There are quarrels now and then, it is true (as among sparrows, for example), but such petty conflicts are neither protracted nor dangerous, for the weaker party soon acknowledges his inferiority by quitting the fray.

The only mental discomfort to which animals are subject—and even this is only experienced by the

males—is the angry emotion aroused by jealousy. Every male wishes to retain sole possession of his own female or females, and is irritated by the sight of a rival. Then will ensue a battle-royal, or we should rather say a trial of strength, for it is a rule faithfully observed by animals, when two males fight for the possession of a female, that neither of them shall be killed. As soon as the weaker of the two recognises his inability to conquer, he prudently withdraws. The other does not abuse his victory by pursuing his rival, but allows him to retire in peace.¹

Thus it is that wild horses, camels, etc., bite their adversaries but refrain from kicking them with their formidable hoofs. Rabbits and hares leave behind them on the field of battle not corpses, but only tufts of hair. Rams, stags, antelopes, etc., butt one another, often with much clashing of horns, but never use the sharp points. The oryx (also called sabre antelopes on account of their long, straight horns tapering to a point) rush at each other with heads down and meet with a loud crash. Each tries to push the other back, then they separate and begin again, until one or the other leaves his rival in possession of the field. Neither of them makes use of his horns; these are formidable weapons with which they can dangerously wound, and even kill, the lions that attack them.

Here again we find only the minimum of pain.

That the combatants, in spite of their furious jealousy, do not fight to the death, is to the advantage of the race. If the two rivals really tried to kill each other, even the victor would in most cases

¹ An exception, however, must be made in the case of salmon, which attack and kill each other, not for the privilege of possessing the females, but for that of fertilising the eggs.

be grievously wounded, that is to say, physically weakened at the very moment when it is essential that he should be in the best of condition in order to transmit health and strength to his posterity. The chivalrous encounter and the ensuing triumph, so far from weakening the conqueror, only serve to enhance his might.

Another consideration is that the fighters very often happen to be a male in the plenitude of his strength and another much younger animal. Were the latter to be killed, the race would undoubtedly suffer ; but, in fact, he is only kept away from the females for a season, that is, until he has grown strong and clever enough to conquer in his turn and thus deserve the guerdon of paternity.

This feeling of jealousy and anger, leading as it does to a struggle in which victory goes to the one who is superior in strength, energy, and intelligence, is in truth a great blessing for the race, since it tends to implant these selfsame qualities in the new generation.

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An ornithologist writing on the subject of animal suffering tells us that he saw a pair of birds in a cage, whose young ones had been killed by a cat, lamenting for the space of two days, and he asks : " Is not Nature cruel to cause such anguish to parents ? " Now, it is evident that maternal love, with all the tender care it lavishes on its object, is indispensable to the life of young birds. And, that being so, it is impossible that their untimely end should not cause suffering to the parents. The only way to prevent this suffering would be for them to have no love for their children ; but in that case, as we have just said, the latter could

not survive. Moreover, in the present instance, the parent birds were caged, which means that they were not obliged to procure their own food ; hence their grief, having nothing whatever to divert it, was able to continue for two days. In a state of freedom, and obliged to work for their sustenance, the birds would have forgotten their loss much sooner, for work is an excellent antidote to all kinds of sorrow in the case of animals as well as man.

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Let us now turn to consider the enjoyments open to animals living in a free state. In the first place, their birth coincides with the season of the year in which the food that suits them is most abundant. The mating season is fixed with this object in view, and it varies therefore according to species and country. In Europe, for the majority of birds, it falls in the spring and summer time ; in autumn for pachyderms, ruminants, and bats ; towards the beginning of winter for rodents ; and during the winter for carnivora (with the exception of bears). The “ muscardin ”¹ breeds in August, when the nuts are ripening.

As soon as it is born, whatever species it belongs to, the young animal is tended by its parents with the usual care, and quickly attains its full strength. If an herbivorous animal, its life will be spent in grazing, resting, sleeping, fleeing on the approach of an enemy, propagating its species at certain seasons of the year, and afterwards in feeding and protecting its young. Finally, long before the advent of old age, it succumbs to a quick and painless death. Or if by chance the animal has lived long enough to feel the infirmities of age, a day will

¹ A kind of small dormouse living chiefly on nuts.

come when, no longer able to keep up with its companions, it is swiftly despatched by one of the carnivora that are not bold enough to seek their prey amidst the herd and yet sufficiently strong to attack an animal enfeebled by years.

If it is a carnivorous beast that we have to deal with, we shall find that its mode of life is undoubtedly more enjoyable because it is fuller of variety. The flesh-eater has to discover, catch, and kill its prey. These operations require a great deal of cunning, keen powers of observation, and inexhaustible patience; afterwards, at a given moment, promptness of decision combined with rapid and well-timed movements of the body.

Hunting probably has a peculiar fascination for the wild beast. Even among ourselves there are individuals of atavistic tendencies who will gladly undergo severe fatigue, brave all weathers, and submit to a thousand discomforts for the sheer pleasure which they find in the chase; and sometimes, when it is a question of killing lions, tigers, or elephants, they expose themselves to very real dangers.

The joy experienced by hunters is certainly shared by all carnivora, whose business it is likewise to engage in the pursuit of their prey.

The wild animal has the further pleasure of seeking out a mate and rearing a family. It is true that this imposes new obligations on him: he will have to spend more of his strength in hunting than before, in order to feed all the mouths dependent on him. These obligations appear, nevertheless, to be thoroughly agreeable to him, if one may judge by the signs of satisfaction with which he brings home the freshly-killed game before touching it himself.

For the matter of that, enjoyment of life is transparently visible in all animals in the free state, whether their food be grass, flesh, fruit, or insects. Even the hare, said to be the most timorous of creatures, is really very lively and gay. In its own particular meadow or ploughed field it enjoys itself quite openly, showing no trace of anxiety. It gambols, frisks, scurries about, and turns somersaults. Every one of its movements is clearly the outcome of high spirits and lightheartedness.

Sheer enjoyment of life also moves many birds to warble and sing at other times than the pairing season.

But it is in young animals that this gladness is most patent to the eye, and it nearly always manifests itself in exuberant fashion by great vivacity of movement: so in badgers, deer, buffalo, tapirs, lambs, colts, gazelles, kittens, puppies, pumas, foxes, lion-cubs, weasels, monkeys, bear-cubs, wolf-cubs, martens, kids, marmots, squirrels, seals, all kinds of birds, etc.

Another point we may mention is that the games in which young animals indulge, besides being now the effect, now the cause of their gladness (they play because they are happy, and are happy because they play), also accustom them to make the swift, well-judged, and perfectly correlated movements which will be so useful to them later on in attack or defence, and in providing for their own needs.

* * *

To sum up, then, it would appear that non-domesticated animals spend a happy life, and die for the most part without pain. If this is so, the struggle for existence, so far from subjecting animals to cruel and almost uninterrupted suffering, actually

secures for them, as Russel Wallace points out, the maximum of pleasure compatible with their physical and mental organisation ; for it must not be forgotten that, given health and strength, the mere fact of being alive constitutes happiness.

This was assuredly in Darwin's mind when he wrote : " When we reflect on this struggle [for life], we may console ourselves with the full belief that the war of Nature is not incessant, that no fear is felt, that death is generally prompt, and that the vigorous, the healthy, and the happy survive and multiply."

* * *

With regard to man, it may be said that, while his feelings of pleasure are more varied, more intense, and of a nobler type than those of animals, the pains that he undergoes have been, so far, both more numerous and more searching.

As far as occasional physical pain is concerned, however, it should be added that the recollection of past suffering fades very rapidly. A short time after the extraction of a tooth, we are hardly able to recall the exact sensation we experienced—and, in order to do so at all, we are obliged to picture ourselves seated in the well-known chair with the dentist and his instruments at our elbow. Without this effort of the imagination, all we remember is that the operation hurt us, and that is all. So in the case of a broken arm or leg, or after severe labour at childbirth. No sooner has the child been born than the mother forgets her sufferings, and as a rule has no little difficulty in recalling them to her mind with any distinctness. In every case, indeed, the recollection of physical pain, however severe, quickly loses all its sharpness.

Nevertheless, it is true that man at the present day does still suffer in body, heart, and mind.

If we try to ascertain the chief causes of his many pains and griefs, we shall find that they are manifold. For example : the necessity which exists for many (but which must surely disappear in course of time) of living in an unhealthy environment, be it physical, mental, or moral ; the vicious taints of every description transmitted by "heedless" parents ; the restriction of free individual development due to iniquitous laws ; the truly curious habit of mind which causes a man to suffer in anticipation from a thousand ills which may never come to pass. Add to all this the fact that man suffers through his rebellious instincts, because he cannot yet realise how grand and fine and noble it is to submit unreservedly and of his own free will to the decrees of Nature.

But the most potent cause of all appears to be egoism and the lack of true brotherhood which compel each man to bear his burden alone. And with many people there is superadded the more or less intermittent, yet sometimes very lively, fear of death.

For our own part, we firmly believe that by and by, when man comes to understand and love Nature better, he will try to live in perfect harmony with the laws of this benevolent mother, and will then accept death without repining, because he frankly approves and welcomes the enforcement of the primordial law which decrees that the individual shall disappear in the interests of the whole.

And, in general, he will be much happier and less inclined to bemoan his fate when he has convinced himself that there is nothing arbitrary about Nature—that everything, on the contrary, is governed by fixed laws which spring from the

irresistible quality inherent in the constitution of things, and which are supremely just in that they exact obedience from all, impartially and without exception, in the interests of the universe as a whole.

* * *

Objection :—" Nature is cruel because, to attain her ends, she has had recourse, and continues to have recourse, to the struggle for existence, which necessarily involves the extinction of the less fit."

Answer :—The people who speak or think in this way surely forget that they themselves act just as Nature does.

When we want to engage a clerk, a workman, a domestic servant, or any other kind of assistant, do we not choose, among those who apply for the post, the one who seems superior to the rest? We decline to employ people whose ignorance, laziness, ill-health, unwilling temper, or other mental and physical defects would prevent them from rendering us the services we require.

What literary man would appoint as his private secretary a young fellow hardly able to read and write? What bandmaster would engage a one-armed man to be his first flute-player? What mother would entrust her baby to the charge of a brutal, violent-tempered nurse, addicted to drink? Where is the banker who would congratulate himself on having as his head cashier a man convicted several times of dishonesty? Who, wishing to sit down, would insist on having a rickety chair with weak legs? Which of us, having an urgent and important letter to write, would select a spluttering pen? And when we buy a horse, what care do we not take to acquire an animal that is sound in wind and limb.

Is it not obvious that man is always and every-

where in the habit of making a careful selection amongst things, animals, and people, asking the *superior* ones for their co-operation and rejecting the inferior ones, or at least those that he thinks so? We want our work to be done well, and therefore decline the services of inferior or unsuitable assistants. Why, then, do we abuse Nature so roundly because she does exactly what we do our ourselves?

In fact, men and Nature reason and act in the same way, because, man being an integral part of the Whole, Nature and he have necessarily the same kind of intelligence, and consequently are led to solve problems in the same way, and to overcome difficulties by identical means.

Nature sacrifices the inferior, it is true, but only for the general good and with the minimum accompaniment of suffering. She carefully selects her assistants so that her work may be well done, that is to say, to the sole end that life may be manifested in all its beauty, power, and intelligence.

Could she achieve this result by resorting to any other means? Obviously not.

To tell the truth, Nature does not demand the extirpation of the weak; that is not her object. What she does insist upon is the continuance of life that is vigorous and intelligent. If the unfit disappear, it is only as an indirect consequence, so to speak, and because there is really no other alternative.

* * *

Objection :—"Certain plants are poisonous, and the man who eats of such plants or their fruit will sicken or die. The bite of many snakes is fatal, and so are, in many cases, the wounds inflicted by lions, tigers, and other wild beasts. Is not this a proof that Nature is sometimes an enemy to man?"

Answer :—Some plants are poisonous in the same way that other plants have thorns, not for the sake of injuring man, but only for the very natural purpose of safeguarding themselves against destruction at the hands of their enemies, whoever these may be. And we do not think that they can be blamed for this precaution. What is more natural than that they should protect themselves against the attacks of man or beast ?

At the same time, it should be noted that the means of defence is always proportionate to the strength of the attack—a fact which points to its being a measure of self-protection only, not of aggression.

It is true that the nettle, for instance, manufactures formic acid, which is stored in the hairs covering the plant, but these poisoned hairs are directed against its bigger foes (such as the herbivora), which might be tempted to make a meal off its leaves and stalk.

In order to keep off lesser enemies, such as snails and slugs, the nettle is content to cover its surface with smaller hairs growing closely together. As these tiny hairs form in themselves a sufficient barrier, no corrosive liquid is secreted in them. The plant does not try to sting or to burn the snails, but is content if it can keep them at a distance without hurting them in any other way.

As for the snake, which in common with all living things, including man, has the instinct of self-preservation, it produces its venom only because it is useful as a means of defence and of obtaining food. (Moreover, the animals on which snakes feed are for the most part so small as to be killed very swiftly by the poison.)

Although the numerous species of the animal

kingdom have evolved in different directions, the object of the evolution has always been to enable each animal to secure more easily the food it requires, to escape with greater certainty from its foes, and to ensure the continuity of the race.

Thus the development of every animal and vegetable species has been for its own advantage, and nowise in order to subserve the well-being of man, to supply his wants, or to provide him with food.

Nature is no more hostile to man than to any other living thing. So far from being his enemy, has she not developed in him a brain superior to that of every other animal, thanks to which he has been able to attain his pre-eminent position ?

When man attacks another living creature, it is the right, nay, the duty of the latter to defend itself as best it can. Or are we to say that lions and tigers must meekly allow themselves to be killed ?

It sometimes happens that the animal itself is the attacking party, being in search of food. What is our reply to this ? The carnivora attack only in order to live, in order not to die of starvation, so it is justifiable warfare. And, as we have seen, the pain inflicted by wild beasts on their prey is extremely slight, if indeed it can be felt at all.

* * *

Objection :—" In some cases, Nature sets us a bad example (as when bees kill their own brethren, the drones). By the theory of morality, based on the laws of Nature, are we not bound to follow this example ? "

Answer :—If we look at the course of certain rivers on the map—the Danube, Ganges, Indus, Mississippi, Seine, Thames, Tiber, etc.—with their sharp bends and winding curves, we shall see that

contradictory opinions as to the direction of the stream might be formed by local observers stationed at different points along its banks. One would declare that the river was flowing north, another would be equally positive that it was flowing south ; some would feel quite sure that its trend was towards the east, while others, again, would firmly believe, on the testimony of their own eyes, that it was making straight for the west. Only one who had studied the course of the river in its entirety could gain an accurate notion of its general direction.

Or again, if we want to know the objective of an army on the march, we should not follow the officers detailed for special errands and each going in a different direction ; nor should we follow the ambulance waggons returning to the rear in order to discharge their wounded ; but we should take careful note of the direction in which the army as a whole is marching.

So with regard to our present inquiry. We must be guided, not by a few isolated facts, the significance of which we are not always able to grasp, but by the general tendency observable in Nature. We shall then see that, at all times and in all places, Nature's desire is for Life in its most vigorous form.

As for the exceptional case of the drones, the reason alleged for their slaughter is that if these males (who have been idle all the summer) were to spend the winter in the hive, or if the male larvæ were allowed to live and develop into drones, the store of provisions set aside by the working-bees would soon be eaten up by six or seven hundred voracious insects (for their appetite is of the heartiest), and the whole community would perish.

This reason is cogent enough, but it can be supplemented by another. Supposing that the drones of

one year were to live until the following summer, one of these elderly males might by some sport of chance become the husband of the young queen. From such a union there would spring a whole generation of weak and sickly bees, and the existence of the hive, their commonwealth, would be seriously imperilled. The old drones disappear so as not to hinder the expansion and development of the community.

With human beings the case is altogether different. The development of the community is not impeded by men who are past their prime ; on the contrary, their experience and the scientific and other knowledge which they have acquired enable them to do useful work to further its expansion. Consequently, there is no reason why our younger sisters should slay us as soon as our hair begins to whiten !

* * *

Objection :—" If it has really been Nature's aim, from all eternity, to produce more life, how is it that the maximum was not reached long ago ? "

Answer :—We believe, with Bourdeau, that the Whole, in order to live its life in the fullest sense—that is, to be able to enjoy the widest range of activity—had to split itself up into a multitude of particular objects differentiated from one another, for otherwise its existence would remain vague and indeterminate.

Each of these particular objects, be it star, planet, man, animal, or plant, passes through five principal stages : birth, growth, maturity, decay, and death. Life throughout the Universe endures only by constant renewal, whence the law by which everything that has a beginning must also have an end, everything that is born has to die. But by " death "

must be understood not annihilation (for nothing can be annihilated) but simply reversion to the original state.

There can be no doubt, for example, that after millions of years all animals, including the human race, and after them all plants, will gradually die out ; their substance, however, will return to earth, air, and water. Later on, the whole solar system (including, of course, our own planet) will also revert to what may be termed its original state. (Ether and electrons ?) But this neutral condition, as we may consider it, will not last for ever. A nebula will again be evolved out of the mass of ether or electrons and will gradually be transformed into a sun and planets. These latter will engender living things, which will strive in their turn to develop, to live ever fuller and better lives, and to expand to their utmost capacity.

The " partial universes " without number which exist at the present moment have all had a beginning, and will therefore all come to an end, each at a different period of time, but only to be born anew.

This cycle of birth, growth, maturity, decay, and death has occurred an infinite number of times in the past, and will be repeated an infinite number of times in the future.

The forms of substance change—in other words, they are born and die ; but the Universal Substance is of its essence everlasting. This substance, that is known to us in its outward manifestations as Cosmos, the All-embracing Unity, the Great Whole, Nature, or the Universe, never having had a beginning, can likewise never have an end.

Always in motion, its activity never ceases, and is always directed to one determinate end : self-expansion through the medium of life. One after

another, so soon as their motive force is exhausted, it breaks up the forms that have issued from itself, and this to the end that new forms may arise, instinct with youth and vitality.

It is true, then, that an increase of life has been Nature's eternal aim ; but each planet, after having supplied the maximum quantity of life and intelligence that it was capable of producing, returns to its " original state," and the cycle starts afresh so as to enable the Whole to renew its activity.

The phenomenon is comparable to that of an annual plant, which germinates from a seed in the spring, steadily continues its growth, and finally produces its maximum of life with the formation of flowers and fruit, after which it dies. But its seeds, which may in fact be regarded as the plant itself under another form, being filled with fresh vigour, germinate in the following spring, only to die in their turn after having put forth their maximum of life. And this cycle is repeated over and over again for an incalculable number of generations.

* * *

Objection :—" If everything has to begin afresh, and always starts again from the same point, what is the use of any action at all ? What is the use of trying to expand and develop ? What is the object of working for future generations, if those who come after us in the far future will have to begin the same task over again, when a new Earth is brought into being, and so on to all eternity ? "

Answer :—One might as well ask : what is the use of teaching our children how to read and write, or of instructing them in arithmetic, history, geography, literature, and science, seeing that a time will come when those children, having grown up and lived to old age, must die, carrying their knowledge and experience with them to the grave,

and that the whole process will have to be repeated with each generation ?

Or, to take a more homely illustration : what is the good of getting up in the morning and going through the same routine every day, since you will have to go to bed in the evening ?

Or, going a step further still, why not say what Dr Swift said to his valet : " You tell me that you are hungry and want something to eat. But what is the use of eating now, since you will be just as hungry to-morrow, and will have to begin all over again ? "

Each of these questions, including those that constitute the objection, carries its own reply with it.

We are active and seek our full expansion and development because in so doing we experience the pleasurable sensation already alluded to, which arises from the harmonious accord of our individual will with the will of Nature. The more perfect this harmony, the deeper and more lasting is our sense of pleasure.

But in order to render this harmony perfect, it is necessary that we should work not only for our personal development, but also for that of as many of our fellow-creatures as possible both in the present and in the future.

The assurance that by acting thus we are contributing to the sum total of life in the universe satisfies our noblest instincts and encourages us in our activity.

If on the contrary we remain inactive, we feel irritable and ill at ease in mind and body, just as though both were suffering from remorse.

Thus the answer to the question, " What is the use of action ? " is found to be twofold : Activity is good and profitable, (*a*) because it fills us with

pleasure, and thus satisfies our egoistic instinct ; (b) because it helps the whole to live in the fullest sense, and thus satisfies the altruistic side of our nature.

Should these two reasons, however, be still insufficient for some people, we can add yet a third.

We are active because—so long as we are not unwell—we simply cannot help it ! A healthy man finds it impossible to remain recumbent and motionless for more than a certain length of time. For anyone who is not actually ill, a prolonged spell of inactivity becomes positively painful, and a moment must come when the wish “to be doing something” will prevail against the feeling of indolence.

When we say that some one is lazy, that simply means that he is loth to exert himself in certain ways, not that he is disinclined for any sort of action. Many so-called idlers become very energetic when amusement is their object.

The hermits of the early Christian Church and of the Middle Ages tried to do away with action altogether, but we know from their sad complaints how much they suffered from this inactivity, although it was never more than partial.

In the main, then, we act because the life that is in us forces us to do so. It is impossible for us to abstain from action.

* * *

Objection :—“ If a man gets drunk, and declares that in so doing he has obeyed the promptings of his nature, we have no right to blame him, since he has acted in conformity with Nature.”

Answer :—There is a confusion of terms here. When we preach obedience to the laws of Nature, the word Nature, as we have already said, is to

be taken in the sense of Cosmos or Universe, whereas in the mouth of the drunkard it means personal temperament. Now, the nature of this man (his temperament) is so entirely opposed to Nature, that if he persists in getting drunk—that is to say, in running counter to Nature's biological laws—he will become brutalised (which means diminution of life) and finally succumb (cessation of life). After having given him several warnings (through his liver, kidneys, heart, arteries, and brain), Nature will do away with him, because she has found that he is a bad workman.

* * *

Objection :—"Wine is a natural product, hence it is natural that it should be drunk."

Answer :—We have heard this argument put forward in all sincerity by several people. The answer to it will have already suggested itself to our readers. Nature produces grapes, but never wine. Wine is the outcome of an operation performed by man.

To accuse Nature of producing wine is as unjust as it would be to accuse her of producing bayonets, on the plea that iron ore is found in the bowels of the earth.

* * *

Objection :—"If it is right for us to obey Nature, we must follow not only our good but also our bad instincts, since they are all natural."

Answer :—Yielding to bad instincts is so far from being what Nature desires, that if any group of individuals (nation or tribe) were to give itself up collectively and without restraint to brutal selfishness, debauchery, drunkenness, violence, murder, or any other sort of crime, that group would automatically disappear. And this in itself would

be sufficient proof that the group in question had failed to bend its energies in the direction required by Nature—that is to say, towards a life ever increasing in perfection and harmony.

Can one, indeed, imagine the possibility of strong and healthy children being born of individuals tainted with vice? Can one imagine children born of vicious parents capable of conquering in the struggle for existence? Nature has no place for persons of this description, who prove themselves unworthy servants, and even if she does not extirpate them at once, she may be relied upon to destroy their stock; for let it be repeated that all living things are bound to observe a certain minimum of altruism and morality under pain of ceasing to exist, if not always in their own individual selves, yet most certainly in the long run as a race.

* * *

Objection :—"So far from being 'natural,' is not morality an artificial product of man's own invention?"

Answer :—On this point, we shall content ourselves with a quotation from Th. Ribot, who says : "After all, these general principles (of morality) have nothing mystic about them. They are merely the conditions governing the existence of any form of social life. No human society, even the simplest, can live except under certain fixed conditions. Imagine a society in which it is considered right, or simply a matter of indifference, for its members to kill or rob one another, a society in which parents may desert their children, and children ill-treat their parents : it is perfectly clear that a society framed on such lines cannot continue to exist; it is doomed to perish by a vice inherent in its very constitution. One might as well expect an

acephalous or hydrocephalous being to live and propagate its species, which would be a physiological absurdity. Every monster, every organism standing outside the normal conditions of life, must inevitably perish; and the same thing is equally true of the social organism. Now, morality reduced to its essential principle is really made up of these conditions, which being absent human life tends to disappear. It is not a mere convention, therefore, but the simple truth to say that morality is natural, since it is a necessary consequence of the nature of things as they are. Likewise, morality may be termed immutable, necessary, and imperative, taking these words not in the vague, transcendental, and elusive sense generally assigned to them, but in a precise, positive, and unequivocal sense, for they mean that its stability is the stability of Nature, and its necessity the necessity of logic."

We may add that, on the whole, the morality freely adopted by man tends to effect, in a conscious way, the very same things which animals have been doing more or less unconsciously for millions of years. For, indeed, the primary tendency of this morality, whether based on reason or instinct, is towards the preservation and expansion of life.

* * *

Objection :—"Since life in all its forms is a thing we should hold dear, we ought to refrain from killing insects and animals, even those that are harmful to us."

Answer :—"The duty of every species, animal or vegetable, is to live. This is also the duty of the human race. It is evident, then, that man has the right to get rid of insects and animals that hinder his development either by endangering his life (lions, tigers, serpents, etc.), or by spreading

diseases (rats, mosquitoes), or by destroying his crops (caterpillars, locusts).

At the same time, this motto should always remain engraved on our inmost heart: "Respect and sympathy for every living thing." We shall destroy nothing, therefore, unless absolutely obliged. We shall not, wantonly and without necessity, tear off branches or leaves that happen to hang within our reach; we shall not pick wild flowers merely to throw them away. In a word, we shall allow all things to live and develop as far as possible without interference.

Not only shall we refrain from destroying them, unless absolutely obliged, but we shall not make them suffer. We shall not amuse ourselves by setting our dog to chase a cat that is walking sedately down the road; we shall not take young birds from the nest and shut them up in a cage; we shall not flog a horse that is drawing a heavy load, nor frighten him by cracking the whip, but speak to him and encourage him with the sound of our voice.

We shall use no traps that cause injury and suffering.

We shall not go hunting "for pleasure":
Respect and sympathy for every living thing!

* * *

Objection :—"For long ages man has been fighting against the forces of Nature. . . . And now that he has at last become nearly civilised, he is devoting the greater part of his energy to the conquest of those forces."

Answer :—Man cannot conquer the forces of Nature, nor can he fight against them. These phrases, that we meet at every turn, are utterly meaningless. The truth is, that man has gradually acquired a better understanding of these forces, and

that, instead of fighting against them and trying to conquer them, *he has learned to work with them, to follow the direction in which they themselves are working.*

What does man do when he wishes to protect himself against lightning? He does not fight against electricity, but on the contrary facilitates the union of the positive and negative currents by means of a metal rod, thus anticipating their own inclination.

A similar remark applies to the Pasteur method of treating diseases. It was necessary first of all to ascertain the laws regulating the life of bacilli, and then those that determine the functions and activity of the phagocytes and the serum of the blood. At this point came the intervention of man, in order to *facilitate* the action of the serum and the phagocytes; but the laws themselves remain the same as before, and cannot be brought into subjection by man.

* * *

Objection :—"The object of mankind should be a rectification of Nature in accordance with a human ideal."

Answer :—It is quite impossible to admit that the object of mankind should be a rectification of Nature. Adaptation to the laws of Nature, if you will, but not a rectification. Are you going to rectify the laws of gravitation, or those that control the formation of chemical compounds? Is your rectification of Nature to be such that a man may throw himself into a blazing fire and come out unharmed? Are you going to change the laws of physiology so that we may be able to live without having to absorb a certain quantity of oxygen at regular intervals?

Our wisdom should lead us to submit to the laws of Nature and to adapt ourselves to them just as we should adapt ourselves to anything that we cannot alter. We must have union among men in the place of contention, it is true, not because this is a rectification of Nature, but on the contrary because we are thus obeying the great natural law that we may call the law of *co-operation in the interests of life*.

* * *

Objection :—"In the constant proportion of saline matter in the blood, and in the constant temperature of the body, have we not a proof that Nature, instead of favouring activity and development, aims above all at preserving the *status quo*? And, consequently, may it not be said that what we call evolution and adaptation to environment has taken place only in order to ensure the life of the cell by keeping it in its original environment and preventing any change? For, after all, how can there be any genuine evolution when there is this phenomenon of constancy that is opposed to it?"

Answer :—If the life of the cell had been all that Nature was striving for, she would have been content to reproduce marine cells indefinitely, since their original environment, the ocean, would have been far more favourable to them than any other. Nature would not in that case have gone beyond the primitive cell, for such a cell would have found all that it required in the sea, with much less trouble than in the bodies of animals.

But Nature did not act thus. She created land animals, which complicated matters greatly. Being built up of marine cells, these animals were obliged to reproduce a miniature ocean in their own bodies and carry it about wherever they went, and that involved much continuous hard work. For they had to create, develop, and bring to perfection a

whole number of different organs—organs of vision, locomotion, prehension, mastication, digestion, etc.—so as to be able to seize their prey and, by means of complex chemical processes, to turn it into suitable food which they could assimilate. The cell of the ocean, on the other hand, was always immersed in a regular “culture broth,” where sufficient nourishment could be absorbed by osmosis.

The living cell made its first appearance in the sea at a time when the chemical constitution as well as the temperature of sea-water was most favourable to life. Now, the conditions that were favourable to the life of the cell millions of years ago are still favourable to it to-day. It is reasonable, therefore, that Nature should continue to provide for the cell’s abode the same fluid which was and is so well adapted to serve as a vital medium. But thanks to the appearance and evolution of special organs, the life of the cell that began so humbly and simply has now become conscious life, and has reached a high degree of development.

The law of constancy has reference only to individual cells, whereas the law of evolution is applicable to organs, and to the animal as a whole.

Quinton very aptly observes that “all the acts of life have one useful end in view—that of living.” To which we will add, that the living thing, in order to obtain the fullest life, avails itself of the principle of constancy (in salinity and temperature) as well as of adaptation and evolution.

The conjunction of these three things—constancy in the cell, adaptation and evolution in the bodily organs—renders possible not only a greater quantity of life, but also a life characterised by the maximum of activity, vigour, and intelligence, thus clearly

marking the final goal towards which Nature is ceaselessly moving.

* * *

Objection :—"It is maintained by a few scientists, in opposition to the general view, that the appearance of birds was posterior to that of man. They base their assertion on 'the anatomical and physiological superiority of the genus bird to the genus mammal' (higher development of the bird's anatomy as regards physiological division of labour, new organs, and other apparatus). This would indicate that the process of evolution has reached its highest point in the bird and not in man."

Answer :—We know that evolution—that is to say, the advance from the simple to the complex, from uniformity to diversity—"has often made its way through ups and downs and along broken lines, circumstances not always permitting a continuous ascent and uninterrupted progression in a straight line."

For example, men and monkeys had a common ancestor. At this point the stream of evolution bifurcated (so far as men and monkeys are concerned) and followed two different channels, one leading to the development of muscle (the larger apes), and the other to the development of brain (man). Why should it not be the same in the case of birds and men?

Even if we admit that the bird was evolved after man (which is doubtful), and that it is physiologically his superior (which is by no means certain), that would only go to prove that, in this case also, a bifurcation took place between physical and intellectual development, the former culminating in the bird with its "superior physiological division of labour," the latter in man with his corresponding superiority in the psychological domain.

* * *

Objection :—"To say that Nature is intelligent is to regard Nature as a being in our own image."

Answer :—In the foregoing pages we have already cited numerous instances of Nature's intelligence. Here are some others. They are of particular interest as showing in unmistakable fashion the intellectual relationship between Nature and man. Both of them overcome their difficulties in exactly the same way.

(The following examples are selected at random, and are not given in the order of their importance.)

*Invented by man after
repeated trials.*

The use of corrosive acid for engraving metal plates. (The lines traced by the artist are etched in the metal by means of nitric acid.)

Electric light bulbs.

Aeroplanes and all sorts of flying machines.

*Invented by Nature long
before the appearance
of man.*

The acid secreted by various organisms, which serves to perforate limestone and even granite, so that they may find a lodging in it. Among these organisms may be specified certain molluscs (phalades, lithodomes, etc.), and many worms belonging to the family of hairy annelids.

Luminous spots on the bodies of many fishes living in the ocean depths.

Birds, butterflies, bees, flies, etc. Also flying-fish, whose pectoral fins, being longer than their bodies and composed of membrane stretched

*Invented by man after
repeated trials.*

The standing army which serves to protect a nation's territory against invasion.

The armour worn by knights.

Road-sweepers and scavengers whose function it is to remove dirt and rubbish.

Water ballast (in submarines), which when increased or diminished enables the vessel to sink or to come up to the surface.

The boat with its oars and rudder.

The blind man's staff.

*Invented by Nature long
before the appearance
of man.*

over a number of thin bony processes, remind one in their general structure of the wings of aeroplanes.

Phagocytes, forming a regular standing army, which attack and kill any disease germs that may find their way into the system.

The shell of the tortoise, etc.

Phagocytes that dispose of worn-out cells, old and useless red corpuscles, etc.

The swimming bladder in fishes, which by contracting or expanding enables them to maintain a state of equilibrium at any depth required.

The fish with its fins and tail.

The abnormally long feelers of insects living in dark caves, and found also in certain blind animals at the bottom of the sea.

*Invented by man after
repeated trials.*

Buffers on railway
carriages meant to dead-
en the shock of contact.

Hot-air apparatus for
heating rooms, which at
the same time acts as a
filter for particles of
dust, etc., in the air
passing through it.

Rubber.

Hinges fitted with
springs.

Glue and gum.

*Invented by Nature long
before the appearance
of man.*

Discs of elastic ma-
terial inserted between
the vertebræ, and in-
tended to absorb all
shocks to the spinal
column, as in walking,
jumping, etc.

The nose, which raises
the temperature of the
air inhaled from without
by several degrees, and
at the same time by
means of its mucus pre-
vents the passage of a
quantity of microbes,
dust, etc.

The impervious yet
highly elastic skin of the
body, which permits of
every sort of movement
without tearing.

The spring-like action
in bivalve shells.

A highly adhesive kind
of gum or glue which
exudes from the tips of
the spreading tendrils
of the Japanese vine,
and enables the plant
to cling tightly to the
support which it re-
quires. — The glutinous

*Invented by man after
repeated trials.*

The chisel used for
cutting wood or stone.

The diving-bell.

The hollow metal cylinders used by builders instead of solid pillars, as being both lighter and stronger.

Chemical compounds produced for industrial purposes.

*Invented by Nature long
before the appearance
of man.*

saliva of swallows, mason-bees, etc., with which they cement their nests.

The front teeth in rodents. Not only do these teeth grow as fast as they are worn away, but as they are somewhat softer on the inside they wear out more quickly there, and are thus always kept sharp.

The nest of the water-spider, which is always kept full of air.

The hollow bones of the body.

Chemical compounds manufactured in the body for the production of various juices to be used in the digestion and transformation of food, so that first of all it may be absorbed by osmosis, and, next, that every part of the body may find in the blood all

*Invented by man after
repeated trials.*

Pipes for the conveyance of the necessary amount of water to all parts of a town, and even into each separate house.

Antidotes to poisons,
discovered by man.

Cords for keeping in place the canvas of tents, the sails of ships, etc.

String to tie different articles together.

Diaphragm of the photographic camera.

*Invented by Nature long
before the appearance
of man.*

the substances it needs.
—Chemical compounds
secreted by the glands.

Arteries and veins to carry the blood into all parts of the body, with the additional improvement of tiny valves in the veins of the lower part of the body, which counteract the effects of gravity, and facilitate the return of the blood to the heart.

Anti-toxins manufactured by the phagocytes and the serum of the blood for the purpose of destroying the poisons introduced by bacilli.

Cords securing the valves of the heart.

Ligaments binding together the 208 bones which constitute the human skeleton.

The iris, which automatically dilates or contracts according to the amount of light to which the eye is exposed.

*Invented by man after
repeated trials.*

Sponge or wet rag
used for cleaning win-
dows.

Barbed wire, the arti-
ficial counterpart of
brambles, for keeping off
men and beasts.

Telegraph wires.

Fishing and fowling
nets.

Filters.

Oil or grease for lubri-
cating machinery.

*Invented by Nature long
before the appearance
of man.*

The moist eyelid,
which by its blinking
constantly removes from
the cornea particles of
dust, etc., which other-
wise would soon injure
the sight. The eyelid
is kept moist by the
lachrymal gland, which
supplies the necessary
liquid in minute quan-
tities. The surplus is
carried off by a duct
leading from the inner
corner of the eye through
the nasal bone.

Natural thorns and
brambles meant to keep
men and beasts at a
distance.

Nerves.

Spiders' webs for
catching flies.

The kidneys, which
filter the blood by ex-
tracting poisonous mat-
ter and transferring it to
the urine.

Synovia, a kind of oil
which lubricates the
joints.—A greasy sub-
stance exuded by some

*Invented by man after
repeated trials.*

Oil or other fatty matter rubbed on leather, hides, etc., in order to keep them supple.

Oil or grease rubbed on metal objects in order to preserve them from damp.

Instruments for the production of musical sounds (wind and string instruments).

The lens and camera obscura used in photography.

Levers for lifting heavy weights.

*Invented by Nature long
before the appearance
of man.*

sixty little glands situated behind the eyelashes. This oily liquid eases the movement of the eyelids so that no friction is felt.

Fatty secretions of the sebaceous glands which prevent the skin from getting dry, and keep it supple and elastic.

The oil with which the feathers of aquatic birds are impregnated as a protection against the wet.

The vocal cords, which can be stretched or relaxed, and are made to vibrate by the compressed air in the lungs.

The crystalline lens and the dark cavity of the eye.

The bones of the arm, the leg, the jaw, etc., which are made to act as levers by means of muscles and the elastic cords, capable of contraction, which we call tendons.

*Invented by man after
repeated trials.*

Mills for crushing
grain.

The microscope and
the telescope.

Parachutes.

The cup-shaped part
of wind instruments
(called the "bell").

Paintings with their
varied colours.

Photographic plates
and coloured photo-
graphs.

*Invented by Nature long
before the appearance
of man.*

Teeth for masticating
food.

The crystalline lens of
the eye, which auto-
matically assumes a
flattened or a spherical
form so as to focus the
image of external ob-
jects on the retina at
whatever distance they
may be—six inches or
several miles.

Dandelion seeds, etc.

The open mouth.

The brilliantly colour-
ed markings on the
feathers of the peacock
and other birds, on the
wings of certain butter-
flies and the petals of
many flowers.

The retina of the eye,
which faithfully repro-
duces the image of ex-
ternal objects, and
which, if properly
trained, shows a mar-
vellous sensitiveness to
colour. Two thousand
different colours are dis-

*Invented by man after
repeated trials.*

The force-pump with
its valves.

Purgatives for scour-
ing away obstructions in
the intestine.

Metal springs.

The hypodermic sy-
ringe.

*Invented by Nature long
before the appearance
of man.*

tinguished in the code
used by dyers. The firm
of Gobelins use no fewer
than 14,421 shades in
the making of their
famous tapestries.

The heart, which with
its ventricles constitutes
a regular force-pump.
The heart has been com-
pared to a pump with
four cylinders working
in pairs.

Colostrum, a liquid
secreted by the mammi-
lary glands at child-
birth, which appears a
day or two before the
milk properly so called.
It is a laxative intended
to flush the bowels of
the new-born infant.

A spring-like mechan-
ism found on the balsam,
lupine, box, broom, etc.,
which being suddenly re-
leased flings the seed to a
distance.—Muscles that
contract and expand.

The stings of wasps,
bees, etc., and the poison-
fangs of snakes.

Invented by man after repeated trials.

Light-signals.

Bellows for sucking in air and expelling it again.

Rubber tubes.

Pipes or tubes laid underground for the protection of telegraph and telephone wires.

Uniform of a special tint, which blends indistinguishably with the landscape, and is worn by soldiers in order that they may be as nearly invisible to the enemy as possible.

Invented by Nature long before the appearance of man.

The light emitted by glow-worms. The female shows her light in order to make her presence known to the male, who has wings.

The lungs, which expand and contract for the purpose of inhaling and exhaling air.

The œsophagus, an elastic rubber-like tube which by its peristaltic movement carries food from the mouth to the stomach.

The vertebral column, or spine, which is composed of a succession of small tubes (vertebræ), and serves to protect the spinal marrow, a long cord made up of a large number of nerve fibres.

A large number of fishes (turbot, soles, etc.) have the power, especially when they are young and need more protection, of assimilating themselves rapidly, in appearance and colour,

*Invented by man after
repeated trials.*

*Invented by Nature long
before the appearance
of man.*

Transparent glass.

to the ground over which they are. It is then almost impossible to see them.

The transparent cornea of the eye, situated opposite the crystalline lens, and the lens itself, which is as transparent as crystal.

Window-panes, which let light into a room but keep out wind and dust.

The cornea of the eye, which allows light to pass through the pupil but protects it from the wind and dust, which would soon dry it up.

The gimlet that pierces wood, etc., by being twisted round and round.

The white filaments of plant roots, which impart a slow but steady spiral motion to their tips, and thus bore their way through the soil after the manner of a gimlet.

We must add that man, in spite of his intelligence, still appears inferior to Nature in many respects. For example, a factory chimney 72 feet high must be at least 4 feet thick at its base. But a rye-stalk 60 inches in height is often less than an eighth of an inch thick near the root. The height of the chimney built by man is not more than 18 times its diameter at the base, whereas the

height of the rye-stalk produced by Nature is 500 times its own diameter.

But the superiority of Nature is most clearly marked by the fact that the organs she creates are, in nearly every case, themselves able to repair any accidental damage they may suffer (broken bones, lacerated muscles, severed skin, etc.) ; and not only so, but keep on renewing the parts that wear out, so that these organs are able to work without a single break for seventy, eighty, or ninety years and more.

Where is the force-pump of man's invention that is capable of working continuously, day and night, for so lengthy a period of time as the heart ? And yet the work done by the heart (in the human being, for example) is very considerable, seeing that it sends about six ounces of blood through the pulmonary artery 100,000 times in every 24 hours, at the rate of 70 beats a minute.

The same may be said of the lungs, a pair of bellows which is also proof against fatigue, and registers 16 inspirations and expirations a minute. This makes a total of something like 23,000 contractions and 23,000 expansions every 24 hours, during which time 640,000 cubic inches of air are passed through the lungs.

The same again applies to the kidneys, which act as a most admirable filter, and indeed to every organ and every part of the body, including the skin, that impervious and elastic covering which in spite of occasional knocks and rents will sometimes last as long as a hundred years, because it is constantly renewing itself and loses no time in healing any abrasion.

Lastly, we may observe that the instruments invented by Nature do their work without making

a troublesome noise. This absence of noise is characteristic, under normal conditions, of the heart and lungs and joints of our limbs. It represents a pitch of perfection which very few instruments invented by man have been able to reach.

Maeterlinck expresses the truth when he says : " We have long taken a somewhat foolish pride in the belief that we are unique and marvellous beings, the product of some miraculous chance which appears to have wafted us here from another world, without any certain link binding us to the rest of creation, and in any case endowed with faculties so abnormal and unparalleled as to be something quite portentous. It is much better for us not to be such prodigies, as we have learned that freaks and prodigies quickly disappear in the natural course of evolution. It is much more reassuring to know that we are travelling along the same road as the soul that animates this mighty world, that we have the same ideas, the same hopes, the same trials, and—were it not for the essentially human aspiration after justice and compassion—almost the same sentiments.¹ It is much more comforting to observe that the means we adopt for ameliorating our lot, for utilising forces and opportunities and the laws of matter, are precisely those which are used by Nature herself. It is much better for us to realise that, from the intellectual point of view at anyrate, this Power (*i.e.* Nature) is closely akin to ourselves. Our mind and hers draw from one and the same source. We are on the same plane—one might almost say, on an equal footing."

Le Dantec has justly said : " Plants have a

¹ On the justice of Nature, however, see above, p. 100, etc.

logic of their own, and act on it just as we do, so that we cannot dispute their intelligence."

And, as we have seen, the same holds good not only for plants, but for every part of every living thing—plants, animals, and human beings. Every living organ is *ipso facto* intelligent. We may go further, and say that every living cell is *ipso facto* intelligent, for life and intelligence are intimately connected and always make their appearance together.

* * *

Objection :—"If Nature desires this fourfold development of body, intellect, ethical sense, and æsthetic feeling, how is it that so many men—who as part and parcel of Nature should submit to her guidance—do exactly the opposite of what she desires, and try to find elsewhere than in obedience to her commands the happiness of which they dream, and the fulfilment of their destiny?"

Answer :—"What is called "life" in an animal or in man is nothing but the sum total of a multitude of little lives which are distributed throughout the whole system. Paul Bert: "Every part of the body lives a personal life, and by every part we mean not only every organ, every limb, but each of those anatomical elements out of which all organs and limbs, and the body itself, are built up." G. Le Bon: "A living being is an aggregate of cells which are also alive." L. Bourdeau: "That it (the cell) has a distinct existence, a real individuality, cannot be gainsaid." In truth, the body is a commonwealth, composed of an immense number of citizens (cells). Not only has each cell its special organisation and distinct functions to fulfil, but, what is more, it has its own peculiarities of feeling, it has its memory (since it preserves a trace of past impressions, and can reproduce them when necessary), its intelligence, its desires or

tendencies, its will; so that human personality is nothing but the sum of all these intelligences, sensations, desires, wills, and memories.

For, as C. Richet very aptly remarks, "the cell is a microcosm which reproduces on a small scale the living being in its entirety. All properties of the cell are also properties of the living being, and all properties of the living being are also properties of the cell."

This then, is the answer which we can now give to the objection formulated above: Each cell, like every living being, seeks to obey the laws of Nature and the impulses coming from her—that is to say, seeks to satisfy its longing for activity, endeavours to live completely, and aspires to its fullest development. But the cells have not all the same strength or the same energy (just as in any kind of society all individuals are not equal in health, strength, energy, or intelligence). This inequality is the result of heredity, of bad education (which has not harmoniously developed all the cells), of the state of health, and of a multitude of other temporary or permanent causes. The strongest and most energetic cells will evidently have a tendency to develop at the expense of their neighbours. The strong will become stronger and stronger, and the weak, weaker and weaker; it is a struggle for supremacy which always ends in the defeat of the less energetic. Thus the brain will inevitably be dominated by such aptitudes or faculties, desires or tendencies, qualities or feelings, as are brought forth by those cells that are most highly developed,¹ and the owner of

¹ It is hardly necessary to recall the fact that intelligence and will-power, although found most highly developed in the brain cells, exist also in every part of the body. A thousand facts

the brain will have a tendency to be generous or miserly, altruistic or egoistic, patient or hasty, sentimental or practical, honest or dishonest, diligent or lazy, as the case may be. It will also depend on the cells that have become paramount whether he is a scientist, poet, musician, painter, sculptor, writer, mathematician, engineer, inventor, etc. If, for instance, we take a great mathematician, we shall see that, whatever may be his environment or the circumstances in which he is placed, or however strong his emotions may be, he will never be a poet. His "mathematical cells" being from birth much more energetic and endowed with much greater vitality than his "poetical cells," our great man will be a great mathematician, but never a good poet. His "poetical cells" have been atrophied by reason of the abnormal development, the superabundant health and vigour, of his "mathematical cells."

We must impress the following truth on our minds: each cell taken separately makes every possible effort to attain its full development, and in this way to conform to Nature's desire; but in any cluster of cells, such as the brain, nothing can prevent certain cells from becoming stronger than the rest and thus dominating, as we have said, the whole group. This is what happens in countries that enjoy a parliamentary form of government. Those citizens that are most active, energetic, and tenacious impose their will on the others, and mould and direct popular opinion. Now, the body is really a sort of commonwealth.

prove it. For instance, the two halves of an Australian ant which has been severed in the middle will turn upon each other and immediately engage in furious battle. Will and intelligence are therefore not confined exclusively to the brain.

Moreover, just as the policy of a country is not invariable, because now one group, now another, assisted by circumstances, events, or by the intelligence, good management, and energy of its chief, gets the upper hand and is in a position to enforce its will, so the brain will sometimes change its bearings. Thus it may happen that a prodigal will turn into a miser; an ultra-sentimental youth will in his later years, perhaps, become "of the earth earthy"; the optimist may become a pessimist, and the amiable man cantankerous. On the other hand, the morose will become gay, and the fiery become gentle; the dictatorial will meekly endure contradiction, and the idler or dreamer may become a zealous worker. The reason of this is that owing to time, change of environment, a different state of health, or a host of other circumstances, the cells which formerly were the strongest have become less strong, or because (which is not quite the same thing) those which were weak have managed to develop. Therefore we may say that not only our abilities, but also our feelings, temper, character and conduct, depend generally, and to a great extent, on the condition, vigorous or otherwise, of certain cells. For instance, the fact that some brain cells are poisoned is sufficient to produce madness. Even a few drops of alcohol may suddenly change our whole mental outlook, and transform a gentle and timid man into a ruffian and a murderer.

Every cell tends indeed to be all that it can be, it truly seeks its fullest development, and is anxious to live as Nature wishes; but if, in the struggle for existence, certain cells are weaker, they will evidently be forced to submit, and the man as a whole will not always be what Nature

desires. Indeed, the man-as-a-whole does not always seem to follow the way pointed out by Nature, but the "fractional man," that is to say, every component part of the whole, every cell, every one of those thousand little personalities which go to make up the total personality, does its very best to be all that Nature wishes. If harmonious development does not take place, it is because the struggle for existence and expansion goes on even among cells, and that the "total will" is not strong enough to school all the little partial wills, and to enable the weak ones to become stronger, or to prevent the strong from crushing the weak.

We are, therefore, up to a certain point, the slaves of a few cells, namely, those that are the strongest. This bondage would be complete and absolute were it not for that marvellous power which is called "will."¹

"Will-power" enables us to silence any of the brain cells we please, and at the same time to increase the activity of others. The mechanism of attention is a case in point. Attention is spontaneous when we are absorbed in something that interests us, but it is voluntary when, for instance, we force ourselves to study a mathematical problem which bores us, or when we make an effort to follow the complicated arguments of a prolix lecturer. In cases where attention is sustained, all the brain cells whose participation is necessary in order to solve the problem, to understand the lecturer, etc., are active, distended with blood, and consequently full of life and energy, whilst all the other brain cells are reduced to a state

¹ By "will" we mean the will-total, that is to say, the sum of those thousands of partial wills which reside in the cells.

of somnolence in which they are quiescent and almost entirely inactive. If our attention is sufficiently concentrated, we lose all sense of our surroundings, forget where we are, and are either wholly or partially unconscious of the noises that are going on around us; and the deeper our absorption, the greater the effort we shall have to make if we are suddenly obliged to change the current of our thoughts.

What attention succeeds in doing (and attention is only a manifestation of the will) can also be done by man's will-power in general. The function of the will is to discipline the cells and exact instant obedience from them—that is to say, to compel certain cells to vibrate immediately when required to do so, and for just as long as is necessary, while the others are reduced to a state of immobility.

Like all our faculties and abilities, will-power can be cultivated and developed. In saying this, we may appear at first sight to have got into a vicious circle. For, in order to strengthen our will, we must first have the will to do it; that is to say, in order to increase the power of our will, we must begin by having some will-power to increase. Happily, that is always the case (except in certain diseases—*aboulia*, etc.). We all have at least a "particle" of will in us. Therefore it is in reality only a question of taking that little quantity, however small it may be, and cultivating it properly; with some perseverance the results will be surprising.

With the reader's permission, we will transcribe the following maxims from an old notebook, the leaves of which are already yellow with age:—

"In order to develop your will, all that you have to do in the beginning is to make small but un-

ceasingly repeated efforts. For example, you have just taken a long walk, you are tired? Do not sit down immediately, but *force yourself* to remain standing a few minutes longer. You are thirsty? It seems as though your tongue was glued to your palate? Then *force yourself* to place on the table the glass of water which is offered to you, admire the limpidity of the liquid, and after a time take little sips, do not empty the whole cup at one gulp. You receive a letter which you were expecting with impatience? Do not immediately tear open the envelope, but *force yourself* to finish the work which you had begun. You have the bad habit of stooping when reading or writing? Think of it and *force yourself* to sit up at once, without waiting to finish the word already commenced. In the morning you would much like to remain a few minutes longer in your warm bed? Be not lazy, *force yourself* to rise bravely as soon as the time has come, winter and summer alike, then *force yourself* to perform conscientiously your ablutions, and sit down without dallying to your work. *Force yourself* always to finish work that is once begun, however tedious it becomes. If in reading or translating you meet with a word which you do not know the exact meaning of, *force yourself* to get up and fetch your dictionary. *Force yourself* to listen patiently and without interruption to people who are talking to you, and to take an interest in what they say, especially if they speak of themselves. Have you to do one special thing which you dislike doing very much? *Force yourself* to do it without delay, and thoroughly. Have you toothache? Do not postpone, through fear, your visit to the dentist until to-morrow or next week. *Force yourself* to pay

the visit that very day if possible. Do you feel impatience rising in you? *Force yourself* to be calm. If, in a discussion, an angry word or a sarcastic remark is on your lips, which at the moment it would give you a mischievous satisfaction to fling at your opponent, *force yourself* to hold your tongue. Does an evil thought present itself to your imagination? *Force yourself* to impose silence at once on those cells which vibrate with this suggestion. Pay no attention to them, and do not argue the point, for a discussion would only endow them with fresh strength; a greater quantity of blood would flow into them and they would vibrate with more energy than before. Simply *force yourself* at once to think of something else, and concentrate all your attention on another subject. *Force yourself* always to bring the maximum of attention to bear on what you are doing, whether it be work of importance or an amusement, whether you are reading or writing, thinking or conversing, or merely playing a game. To sum up, *force yourself* to do thoroughly and without delay the thing which must be done, the act which must be performed. This thing, this act may be of small importance in itself, but the prompt and thorough execution of it is of the utmost importance for your own moral training and the development of your will-power. It is by these means (and by similar efforts which may be multiplied indefinitely) that you will succeed in perfecting your will. It is not a question of performing some great action once in your lifetime—it is easy to be a hero for a few minutes—but it is a question of doing something at once more modest and more difficult; that is, to force yourself to make these small efforts constantly and without

getting weary. It is but right to add that by practice these efforts will become less painful, and in the end, thanks to persistence, they will become mechanical; at the same time, however, bringing you much inward satisfaction caused by the feeling of strength and moral value."

Let us hear what J. Payot says: "It is by innumerable little acts such as these, insignificant though they may appear, that the will is proved and tempered—for all work causes growth. Lacking the opportunity for larger efforts, we should be performing such acts at every hour of the day, with all the zest and thoroughness of which we are capable."

To return to the subject of "temptation": we must remember that the law of association of ideas is one from which there is no escape, and which therefore can always be counted upon. To it more especially, then, must we turn for help. Take a couple of examples: Are we on the point of giving way to a dangerous or merely ridiculous fit of anger? Are we in a bad temper and losing all patience? Let us make a determined effort to keep our attention fixed on soothing ideas, on rational considerations; let us repeat in a calm tone a few lines of poetry or a maxim or two from Marcus Aurelius. Association of ideas will soon make gentle thoughts predominate in our brain.

Are we prone to melancholy and depression, which may react injuriously on our work and perhaps on our health? Let us hum or play a merry tune, or simply force ourselves to smile. This make-believe will help us to banish our depressing thoughts, by creating or stimulating a cheerful association of ideas.

Lastly, whatever the temptation may be that is

assailing us, let us picture the consequences as vividly as possible ; let us think of the morrow ; let us bear in mind the displeasing sensations that will be ours if we succumb, the shame and remorse at having “ done such a thing ”—and at the same time, let us imagine our feeling of joy on issuing triumphant from the struggle ; a joy which is always experienced when we overcome difficulties and give proof of true courage.

* * *

Objection :—“ This morality is all very well for those who are gifted with health and strength, intelligence, and fortune. It would never do for those of low degree, the weak, the infirm, the ‘ poor in spirit.’ It is the morality of a few privileged persons, but not that of the masses.”

Answer :—This is a mistake. This morality is, on the contrary, the only one that can be applied to all beings, and at all times. It has existed ever since the laws of Nature became what they are, and it will exist as long as these laws are not changed. If those laws have been from all time, this morality has existed from all time also. If the laws of Nature apply to all living beings, this morality applies also to all of them. If those laws know no exceptions, this morality also knows no exceptions. If those laws apply to the strong and to the weak, to the intelligent and to the unintelligent, to the rich and to the poor, to the healthy and to the sick, this morality also applies to the strong and to the weak, to the intelligent and to the unintelligent, to the rich and to the poor, to the healthy and to the sick. *It cannot be otherwise, seeing that this morality is the natural outcome of those laws.*

A sick person has duties to fulfil. The first consists in obeying uncomplainingly the orders of

his doctor, however disagreeable they may be. He ought also to show himself as little exacting as possible, repressing fits of ill-temper and impatience, and resisting all temptation to complain. He ought also to express his gratitude to those who are nursing him. In this way he will be able to give a fine example of patience, gentleness, and courage. In fine, he will be able to live a more perfect inner life, a life of fuller introspection, and so turn his illness to good account. Often illness is a school from which a man issues morally stronger and better. After having suffered ourselves, we have a quicker comprehension of suffering in others, and our heart goes out more generously towards them. If we wish it, illness may be supremely useful for our moral development.

As to the feeble-minded, they should make a point of doing all that they can do, all that lies within their capacity. It is obvious that they will not be able to compete with a Darwin, a Pasteur, a Goethe, or an Edison, but they can make themselves useful by performing their work honestly and thoroughly, however humble it may be. They will thus conform to the tendency of the Universe, and will help Nature to live her life. The "weaker vessels" must remember that results are nothing, but that effort is everything. There is no harm in failing, but what is wrong is neglecting to do all that is necessary to ensure success.

Our duties are limited by our power of action, but they are not on that account wholly abolished.

Horace reads us an excellent lesson in one of his epistles: "Though you may never enjoy the keen sight of a Lynceus, you need not therefore despise the salve which will heal your sore eyes. The hopelessness of rivalling the strength* of

Glycon is no reason why you should allow your limbs to be crippled by gout. If you cannot go very far, you can at least win your way up to a certain point."

Is it the poor and lowly that are in question? There are duties for them as there are for the rich. If they lack the opportunities afforded by wealth and rank, they can do as much or even more by goodness of heart. Are not frequent examples of patience and courage, devotion, self-denial, and brotherly love being given by the poor to the rich? Need we instance the lifeboat crews that are ready at any moment to face danger and fatigue, or the rescuing parties who volunteer to go down into mines and heroically endeavour to save their comrades from destruction? Or the thousand and one little services which are constantly being exchanged amongst the poor, such as looking after the neighbour's children while she is away at her work or engaged on an errand, sitting up with a sick person without remuneration, or lending food, clothing, and small sums of money? True kindness is indeed infinitely more precious and more conducive to the general good of the community than power and riches.

But a day will come when poverty and distress will have ceased to exist. A more intelligent view of civilisation, legislation on the lines indicated above (p. 92, note), greater mental and moral development, a better understanding of Nature and her aims, and, above all, a deeper, truer, and more practical sense of brotherhood, are all factors that will gradually bring about great changes in the mental attitude of nations and individuals. Everyone will then be in a position, by means of honest labour performed with the

general welfare chiefly in view, to earn a comfortable living during his youth and middle age, besides making a sure provision for his declining years ; and all alike will enjoy periods of leisure, which may be utilised for the development of the individual on his physical, moral, intellectual, and æsthetic sides, as well as for the social progress of the various groups.

Part III

Duties and Precepts

ON CERTAIN DUTIES

WE must not forget that, as our influence and the scope of our activities increase, the number of our duties increases in like measure.

Hence we have :—

Duties towards ourselves.

„ „ our father, mother, and grandparents.

„ „ our brothers and sisters.

„ „ the other members of our family.

„ „ all those who are concerning themselves with our education.

„ „ our friends.

„ of husband and wife towards each other.

„ towards our children.

„ „ the persons in our employ—that is to say, all those who work for us in one way or another, and thus contribute to our welfare.

„ „ our employers. These include the duties imposed on us by our profession.

„ „ all who stand in need of our help : invalids, waifs and strays, aged cripples, and anyone who is morally, mentally, or physically deficient.

Duties arising out of our pecuniary circumstances and our station in life.

„ towards our particular part of the country
(the village or town that we live in).

„ „ our country in the larger sense
(the nation as a whole).

„ of a cosmopolitan order (towards the entire human race).

„ towards Nature, the Whole.

When we speak of the duty of loving and serving one's country, that does not mean that we should try to restrict the liberty of other countries, impose our will upon them, or take possession of any part of their territory. In this as in all similar cases, our duty consists in developing those elements that make the largest and best contribution to the general life of our own country and of humanity at large.

Thus a list of our duties would comprise all duties towards ourselves and towards all the groups, large or small, of which we form part. So that a complete moral code can be nothing else than a list of the actions that are conducive to the harmonious development and complete expansion of the individual and of the society which is built up of all these groups.

These duties, then, all tend in the same direction ; they really have one single object, and that is the greatest expansion of the greatest number.

* * *

We must not forget that among the duties towards our " weaker brethren " incumbent on us *qua* group are included duties towards criminals. We should endeavour to bring offenders back

into the path of righteousness by implanting in them habits of order, cleanliness, etc., and above all by setting them to do some serious, useful, and regular work suited to each man's natural ability and intelligence. For is not work the best of all reforming agencies?

Lastly, we have duties with respect to animals. Our domestic animals should be treated with kindness and their wants ungrudgingly attended to. As for undomesticated animals, our duty may perhaps be summed up in a single sentence: Cause no unnecessary suffering.

* * *

L. Bourdeau says: "Man being part of the whole from which he is derived, and into which he will again be absorbed, is bound to follow, as far as his judgment will allow, the order and laws of the whole. His conduct must conform to the general tendency of things. He will thus participate in the universal life, not only passively and in ecstatic vision, but actively and in fact. Although he be but an atom in the Infinite, yet since this atom is conscious, endowed with intelligence and will, his influence, though infinitesimal, is a real thing, and contributes to the series of effects in the same way as in the ocean every liquid molecule has a weight of its own, and, by the pressure which it imparts or undergoes, helps to maintain the equilibrium of the whole vast mass of water. What gives life its value is conscious collaboration in work that is infinite and eternal. If, according to a beautiful thought of Aristotle, the true worth of a being can be measured by the greatness of his task, and increases with the extension of his duties, what nobler use of his faculties can be

proposed to a rational being, to what loftier object can he aspire, than to identify himself with the Infinite Being (the Whole) and to take part in the universal life by turning his own powers of action in the same direction ? ”

We know what Nature wants. We say it again : Nature desires the most active, intelligent, and moral life. She wants the most complete expansion, the harmonious development of the whole being. She wishes for a physical, intellectual, æsthetic, moral, and social life which shall ever grow broader and stronger, more intense and more complete. She wants us to be at every moment all that it is possible for us to be. She wants the enlargement of life—that is to say, she would have us act, work, feel, understand, and love, always more and better. It is her desire that each of us should extend his sympathy to all other beings. She wants our hearts to become wide enough to embrace the whole Universe.

Let us obey Nature, let us obey the Whole, not only at the demand of reason, but also and especially out of love. Let us love the Whole with a great and passionate love. Let us pursue the object which it pursues, let us go wheresoever it goes, let us help the Whole to live its great life in the regular, normal way.

Let us work with the Universe and towards the same ends : this is the task that lies before us.

* * *

MISCELLANEOUS PRECEPTS

Obey the laws of hygiene in order to preserve your health and strength, and to be able to be useful to others all the longer.

Dr J. Héricourt : "The science of hygiene, so neglected or so poorly represented in our system of education, forms the very groundwork of morality. Hygiene lays down the rules that safeguard the health of each individual, hygiene turns the struggle against our passions into a regular daily exercise ; it supplies a valuable incentive for the will, and also teaches the true meaning of solidarity by showing what a terrible price may have to be paid for any offence against this grand principle, the keystone of all societies to come." ¹

L. Bourdeau : "Every act in harmony with the laws of life, being a condition or function of its development, tends to bring about an enlargement of life. Every act contrary to the laws of life tends to cramp it within narrower bounds and has a disturbing and prejudicial effect on its orderly development ; it also carries its own penalty, beginning with threats and ending in active repression."

Digest well ; that is to say, assimilate your nourishment properly, and let it be simple and wholesome. Do not eat too much or too little, and above all masticate sufficiently. Dr F. Regnault says : "In all these cases (where the food has not been sufficiently masticated) the result is the same. The gastric juices are unable to

¹ Anyone who still has doubts as to the utility of hygiene may be reminded that in England, where for some years past it has been held in high esteem, the death-rate, which was 80 per thousand from 1660 to 1679, had fallen to 17 in 1889, and is at the present time only 14 or 15 per thousand. A similar decrease, due to the same cause, has taken place in Norway and Denmark. In France the death-rate oscillates between 20 and 21 per thousand.

deal with food that has not been previously reduced to the requisite state of pulp. Consequently it ferments in the stomach and brings about intestinal disorders, being one of the most potent causes of arthritis in all its various forms." Let us also remember that the saliva, in order to do its work properly, must be intimately blended with the food. This process can only be carried out thoroughly in the mouth, and requires a certain amount of time.¹

Dr Jacquet advocates careful mastication as a means of combating dyspepsia, obesity, gout, eczema, arterio-sclerosis, etc.

Consult your dentist at least twice a year. If your teeth are few or if they are decayed, you will masticate badly and digest badly.

Avoid alcohol under all its forms. Drink water that has been boiled and the microbes of which have been destroyed in the process. Water is the natural drink of all animals, including man.

If we may be permitted, we will recall briefly the evils of alcoholism, remembering that a man who is never intoxicated may yet be an alcoholic subject if he "drinks" every day, even though it be moderately. Alcohol, when taken in small doses, does not go to the head (or very little, thanks to habit), but it carries on its destructive work just the same. Dr Weill-Mantou says (we epitomise): "Drunkards whose failing may not be openly exhibited to the public view, nevertheless help

¹ See on this subject *The A B C of our Nutrition*, by Fletcher (New York).

to swell the ranks of consumptives, or succumb when they are still young to cirrhosis of the liver, to diseases of the kidneys, heart, or arteries, caused by the premature enfeeblement and decay of those organs, and they beget children whose vital power is weakened even before their birth. The deadly effect of the poison makes itself felt in every organ of the body and throughout the nervous system. . . . Alcoholism becomes a factor that aggravates all sickness, wounds, and operations.¹ Not only does it cause deterioration in the individual, but it strikes him in his offspring, and leads to the degeneration of the race. For the idiots and epileptics, weaklings and chronic invalids, potential criminals and lunatics that are yearly brought into the world, alcohol is largely responsible."

Legrain (quoted by Dr Maurice Boigey) conducted an inquiry into the effects of drink as shown in the case of 215 families, comprising 508 persons. After the lapse of one generation there were 168 physical or mental degenerates. After two generations, degenerates were to be found in every one of the families. And finally, in the third generation, only 17 members were left, all of them suffering from debility or retarded development.

Alcohol predisposes to congestion, especially during the seasons of extreme heat and cold. Therefore it may be easily seen how foolish it is to drink alcohol in winter, in order to "warm oneself," as the saying is. Rather, drink tea or coffee in moderate quantities, hot milk, or chocolate.

¹ Even the smallest dose of alcohol paralyses the beneficial action of the phagocytes (Metchnikoff).

Above all, consume no liqueurs or bitters. "Liqueurs are dangerous, not only by reason of their alcohol, but more particularly because they contain extracts of aniseed, badiane, absinth, fennel, mint, hyssop, angelica, coriander, balm, etc. Highly toxic in quality, these essences add their own evils to those of alcohol, and, as has been said, they poison that which is already poisonous. All liqueurs are condemned without appeal by hygiene." (Dr J. Weill-Mantou.)

Beware also of medicinal wines. Many drunkards (especially women) have begun with them.

Never give wine or beer to children, not even a drop ; still less spirits. As for young men, alcohol in all its forms is morally dangerous (you understand what I mean) long before it becomes physically so.

We should also be on our guard against opium. Opium-eaters and opium-smokers soon suffer from the effects of the drug. Here is a brief summary by Dr Helme of the evil effects produced by opium, whatever the form in which it is taken.

The blood circulates more slowly through the system and becomes thicker and more glutinous. Less activity will be shown by the liver, that hard-working organ which acts as a filter for poisons ; the kidneys, which have been incessantly occupied in carrying off toxic substances in over-large quantities, will close their doors ; the heart, which has been so excited under the influence of the drug, will "go lame" like an overdriven horse, and heart stoppages will be the result. Antitoxic serums

being no longer produced on account of the benumbing of the cells, the system is incapable of resistance and lies at the mercy of any bacteria that may come along—ordinary influenza, dysentery, or intermittent fever. As for the brain, it imperceptibly loses touch with realities and gradually develops a "kink" which induces topsy-turvy thinking. The names of De Quincey and Coleridge are often brought up in this connection. But De Quincey used to write in his lucid intervals, and in his reminiscences some allowance must be made for exaggeration. As for Coleridge, we see his genius palpably diminishing and losing its lustre as the doses of poison are increased.

We may observe, by the way, that man is the only living creature that voluntarily absorbs poison into his system. Even plants are more sensible than we are in this respect. Indeed, Lilienfeld and others have shown by their experiments on peas, beans, sunflowers, etc., that the roots of plants shun poisonous substances, whereas they are attracted by anything that provides wholesome food for them.

Breathe well. That is to say, absorb the necessary amount of oxygen. Spend all the time you possibly can in the open air. Let your room always be properly ventilated. Leave your window open all night long, winter and summer alike, without, however, exposing yourself to draughts.

You will understand the necessity of thoroughly ventilating your room, if you remember that every twenty-four hours 10,000 litres of air pass into your lungs in order to furnish the necessary quantity of oxygen.

Dr Péter says forcibly : " It is in this stagnant air (of the bedroom), saturated with carbonic acid and all kinds of other vapours arising from pulmonary exhalation as well as the secretions of the skin, that the lungs are 'soaked' all night, as in a sort of respiratory pickle. Accordingly, during the early hours of morning, when the outer air is so pure that the mere breathing of it is delicious, our bedroom air is repulsively fetid. Inhaled and re-inhaled without intermission by our respiratory organs, it is no longer breathed air, but ruminated air." The air in your dwelling ought to be day and night as pure as the outer air.


Let as much sun and light into your room as possible. The sun is a powerful agent for the destruction of germs, and light also stimulates cellular activity. To be convinced of this, remember the pallor, the lack of vitality and general weediness of individuals who live in darkness. Every dark locality is insanitary.

Go into the country in order to breathe pure air, less charged with bacteria, for it is in human agglomerations that microbes swarm. Examples : It has been found, as the result of six months' analysis, that the air in the Rue de Rivoli contains on an average 3220 bacteria per cubic metre, whereas in the Parc Montsouris the average is only 250. The microbes of the air are mainly found close to the ground : if we climb only to a height of 82 metres in the middle of Paris (the top of the Panthéon), instead of the 3220 bacteria of the Rue de Rivoli we shall only find 198. Above an altitude of 4000 metres there are no bacteria at all. On the open sea about 100 kilometres from the coast, only 6 bacteria are found per 10 cubic metres.

Sleep as long as it is necessary but not longer, and when the moment to rise has come, jump out of bed at once and do not dally. The hours of sleep required vary according to one's age, occupation, state of health, etc. ; you must find out the amount that suits you best. The main thing is not to waste precious time by dozing idly in bed.

Do Swedish exercises for a short time every day, and your limbs will remain supple. Engage in all outdoor sports : tennis, cycling, walking, swimming, sculling, etc. Everyone ought to play tennis : grown men and women as well as young people. (For the reasons of this recommendation, see *L'Exercice chez les Adultes*, by Dr F. Lagrange.)

Moderation, however, should be carefully observed. Stop at once when you begin to feel tired. Do not overtask your physical strength.¹

 In short, you should attach neither too much nor too little importance to physical exercise. Devote the right amount of time to it but no more. Take just as much exercise as will keep you fit, lively and strong, impart grace to your movements, and render you more capable of brain-work, thus delaying the onset of old age. For is it not one of our duties to preserve our faculties intact as long as possible ?

Let your body always be very clean. Cold baths (the "tub") are not sufficient. Hot baths and much soap are also necessary. Over two pounds of sweat, in the form of invisible perspiration, are thrown off by an adult of middle height in twenty-

¹ It was already known to Galen that excessive physical exercise, especially of a violent kind, has an injurious effect on the health and is liable to create a diathesis. (A person is said to be suffering from diathesis when he shows a frequent tendency to contract some illness or other.)

four hours ; and naturally this quantity increases with heat, muscular work, violent exercise, etc. Now, what is sweat ? It is a mixture of water, mineral salts, and excrementitious products : urates, lactates, etc. Therefore you see the necessity of taking hot baths often and of using soap without stint. A dirty man is offensive to the eye, and still more so to the nose.

But that is not all. " The importance of the respiratory and eliminatory functions of the skin is so great that if they happen to be suppressed, death will very soon supervene. For instance, an animal covered with a coat of airproof varnish rapidly dies. For the same reason an individual suffering from superficial but extensive burns (after having been scalded by boiling water, for instance) will almost infallibly succumb. Thus we can realise the danger and disadvantages of dirt, which diminishes this activity of the skin." (Dr Weill-Mantou.)

And what about the microbes ? Your skin is infested and infected by them. Judge for yourself. Dr Remlinger made fifty soldiers take baths, and calculated the number of microbes (saprophytic and pathogenetic) left by each of them in the water. The average was 550,000,000. The lowest figure was 85,000,000, and the highest 1,212,000,000. Get rid of this flora.

Wash your hands frequently ; always before a meal, and immediately after all dirty work. And do not forget to keep your finger-nails clean. Never touch face, lips, or nose with the hands.

Dr A. Weiss says : " It appears to be a well-

established fact that certain infectious diseases are mainly introduced into the system through the alimentary canal. At any rate, whole hospital staffs have been known to escape cholera, for example, because they took the simple precaution of washing the hands and face before meals, whilst other hospitals where this was not done suffered heavily."

Wash your hair regularly; once a month at the least.

Cleanse your mouth night and morning, especially at night. Tiny particles of food lodged there will ferment, and microbes multiply rapidly on the teeth, the gums, the tongue—in all parts of the mouth, in fact, which for them takes the place of a damp, hot conservatory. It is therefore necessary to expel them at least twice a day. For this cleansing a good tooth-soap is preferable to powders, pastes, or liquids. Soap is the only composition which, without hurting the enamel, will remove that gluey deposit which forms on the teeth. Very little soap is required. It is also advisable to rinse the mouth after each meal.

Never make a child kiss a sick person, or even one with a cold. For that matter, I do not see the necessity of bringing the lips of a little child in contact with the cheeks (more or less covered with visible or invisible perspiration, with microbes, etc.) of a grown-up person. This performance is nearly always boring, and rightly so, to the child, and is not always agreeable to the older person, on whose cheeks the little mouth sometimes leaves sticky traces.

Do not smoke. Smoking disturbs the action of the heart, dulls the eyesight, discolours the teeth, may induce cancer of the tongue or lips, and runs away with money that might be more usefully spent. And then, why become the slave of a habit?

If you are ill, nurse yourself conscientiously, but do not make a great fuss over the least little ailment. Do not coddle yourself.

Imitate Nature and aim as she does at a life ever higher and more active.

L. Bourdeau : "The Universe may be conceived as an immense being, 'The Great All' of the Stoics, the inexhaustible source of energy whose might is displayed in the double infinite of space and time. This being, which comprises everything, cannot develop its attributes in all their diversity except by differentiation—that is, by producing a series of individual beings; because without them its existence would remain vague, uniform, and indeterminate. In order to realise the fullness of its life the unity must be split up into plurality."

Therefore let us constantly remember that each of us is one of these units, which contributes to the life of the Whole by its own work, its own efforts and activity.

The Whole constitutes an immense Society of which each of us is a member. We ought to be loyal to this Society, and contribute to its development. You are true to the little societies to which you belong; why not be true also to the Great Society?

Ought we not to march in the same direction as the Universe? Ought we not to help the Whole to live its grand life?

We obey the rules of the associations to which we belong; should we not, then, obey the laws of the Universe, the greatest of all associations?

We love the associations of which we form part, and the Whole is surely the noblest of all associations; ought we not, then, to love it with all our heart?

Love the Whole with all your intelligence, with all your heart, with all your imagination. Love Nature in her entirety. Come out of your egotism in order to live the universal life.

L. Bourdeau: "We must love more particularly what is general and permanent in the world, what is best and least precarious: beauty in Nature and in art, truth in science, morality in conduct, the public good in one's own country, the power of life which glorifies the Universe. He who enlarges his heart, and, without scorning the lesser affections, fills it with those great passions, will find in them a perennial source of joy, a constant object for his efforts, consolation in his trials, and the full development of his faculties."

In the towns we are not sufficiently near to Nature; go, then, as often as possible to the country (I mean the real country).

Your brain has need of exercise like all your organs. If you do not exercise your arm, if you carry it in a sling for several years, it will waste away; if your brain remains inactive, it will resemble your helpless arm.

Your will must be strong and stable. If it be not so, you must cultivate it without losing heart, and instead of a sickly, ill-developed plant, it will gradually become a noble tree with roots firmly set, fine spreading branches, and luscious fruit. By "will," I do not mean obstinacy.

Do not forget that everything you read, every word you speak or hear, every thought, every gesture, leaves an impression in your brain that nothing can ever efface.

Be methodical in all things. That will lighten your labour and effect a saving in that most precious commodity, time.

Do everything thoroughly, and as well as possible.

If your work is badly done, it is as though it had not been done at all. Begin it again, once, twice, thrice, as often as is necessary. Above all, do not become discouraged.

Always give the maximum of attention and energy to everything you do, but without undue haste. Work done in a hurry cannot be serious. Nature never hurries, but she never stops either : imitate her.

Epictetus : " Attention is necessary for everything. Have you ever seen anything in life which was better done by being carelessly done ? "

Without attention you are like the drop of water carried on by the current, which sees nothing of the country through which it passes.

Your education is not finished when you leave school: it lasts all your life. Never cease to learn. If you do not continue to learn you will forget what you already know.

Confucius: "Acquire new knowledge whilst ruminating the old, and you may become a teacher of others."

Learn little at a time, but learn it well and thoroughly, so that you need not return to it again. Add only one or two little stones at a time to your edifice, but secure them firmly.

During a short life you cannot learn everything perfectly. Try, however, to obtain a rudimentary knowledge of all things.

Your intellectual development would not be complete if you cultivated, for instance, only science or literature; you must also attend to the arts: drawing, painting, sculpture, music, etc. As I said before, it is impossible to be at the same time a great scientist, a great writer, a great poet, a great painter, and a great sculptor, but you may have a sufficient smattering of these things to be able to love and appreciate them all. Your intellectual life ought to be as complete and intense as possible.

From a practical point of view, and in order to make yourself truly useful, it is necessary, whilst seeking to know all, to specialise in some direction. In the centre of your castle you must erect a high tower. But remember that this massive and

elevated tower will only look noble if it rises in the midst of buildings which, although of smaller size, are solidly built and large enough to combine with it into one harmonious whole.

In spite of all your efforts, you will always find plenty of people more accomplished than yourself. Do not be ashamed of knowing less than they. The only thing you need be ashamed of is wasting your time.

Strive to develop and refine your Ego, the better to serve mankind. For the more you know, the greater will be your usefulness, the keener, nobler, and more numerous your intellectual pleasures.

Every effort that helps in the preservation or development of life, in a material as well as in a moral and intellectual sense, may be considered useful work, for expansion on every side must be made possible to the individual. Ploughmen, bakers, masons, teachers, physicians, men of science, etc., are therefore doing work that benefits mankind, whereas distillers and vendors of alcohol are doing harm, because their work tends to diminish the sum of life.

L. Bourdeau: "Thanks to the long-enduring consequences of his activity, each man leaves behind him an abiding mark of his sojourn in the groups of which he was a member. All the useful work he has accomplished in the course of his life, all the generous sentiments he has experienced himself or inspired in others, the beauty he has apprehended or brought into being, the truths he has discovered or disseminated, the just and

virtuous deeds that he has done—all this is productive of happy consequences which spread further and further, entering into the common patrimony of mankind and swelling the treasure of civilisation. In this way he discharges what Manou calls his 'ancestral debt,' meaning that every man has to pay for benefits received by transmitting the like in his turn. On the other hand, all the evil he has done, all the trouble he has caused, the unseemly thoughts and false conceptions that he has harboured, the bad examples he has set and the social disturbances he has provoked—these things are not only hurtful to himself, his family and his contemporaries, but inflict lasting injury on future generations, who will be obliged, at the cost of much suffering, to rid themselves of an element so fruitful in mischief. There is no act of ours, therefore, which does not help to create a set of conditions either favourable or unfavourable to life in the future. Whosoever leads a life in conformity with the laws of reason adds to the sum of human progress: the workman by his labour, the loving heart by its tenderness, the artist by his ideal of beauty, the scientist by his researches, the good man by his virtues, the philanthropist by his benevolence and active charity. Civilisation is made up of this multitude of small gains which are achieved one by one through the daily efforts of each human being."

Develop your memory, but not at the expense of your judgment and reason.

In order to begin your work in the morning without wasting precious time, without hesitating between several things to do, it is useful to prepare

in the evening before you go to bed a list of the things which ought to be done the next day. On that list you will put down the different items of work which must claim your attention, as well as the visits to be paid, the letters to be written, etc. ; and unless quite exceptional circumstances arise (which rarely happens) you must not retire to rest until you have carried out your programme.

Activity which is devoid of all method and wanders aimlessly from one thing to another has the fallacious appearance of work but is really valueless ; it is only empty bustle.

Do not despair because you have failed in an enterprise. If you have made every effort to succeed, that is sufficient. Your efforts will probably be more profitable to you in reference to your moral progress than the success of your enterprise would have been.

Epictetus : " Do not be discouraged, but imitate the gymnastic masters who, as soon as a young man is knocked down, order him to get up and continue to fight."

Marcus Aurelius : " Do not give way to dejection, disappointment, or despair, if you do not always succeed in doing everything according to the laws of reason. If you have failed, begin again."

Confucius : " It matters not what you learn, but when once you try to learn a thing you must never give it up until you have mastered it. It matters not what you inquire into, but when you inquire into a thing you must never give it up

until you thoroughly understand it. It matters not what you try to think out, but when once you try to think out a thing you must never give it up until you have got what you want. It matters not what you try to sift out, but when once you try to sift out a thing you must never give it up until you have sifted it out clearly and distinctly. It matters not what you try to carry out, but when once you try to carry out a thing you must never give it up until you have done it thoroughly and well. If another man can succeed by one effort, you will use a hundred efforts. If another man can succeed by ten efforts, you will use a thousand efforts.

“Let a man really proceed in this manner, and, though dull, he will surely become intelligent; though weak, he will surely become strong.”

Marcus Aurelius: “Are you unable to claim admiration for the lively qualities of your mind? Granted; but there are many other things in regard to which you cannot say: ‘I am not fitted for it.’ Do those things, then, that lie altogether within your capacity: be honest, industrious, a spurner of pleasures, content with little; show yourself free, benevolent, and disinclined to luxury, frivolity, and grandeur. See you not how many things there are that you can begin doing to-day, and in regard to which you cannot plead want of aptitude or insufficient strength?”

Epictetus: “It is impossible for me not to commit errors; but it is quite possible for me to be constantly on my guard against committing them.”

You have already many a time made good resolutions, which you have not kept: that,

however, is no reason for not making new ones. Every good resolution keeps you in the right path for a few weeks, a few days, a few hours, a few moments : that is so much to the good, and it may be the beginning of a regular habit.

Epictetus : " Habits are overcome by habits of a contrary complexion."

Keep a watch over yourself so as not to fall into bad habits, or merely absurd little mannerisms.

Marcus Aurelius : " When you feel shocked by somebody else's shortcomings, turn your eyes inward and reflect on the similar faults you yourself commit."

Epictetus : " Your true festivals are those on which you have overcome a temptation, or on which you have driven away, or at least diminished, the mastery of pride, recklessness, malice, slander, envy, luxury, or any of the other vices which hold you in their grip. For this a sacrificial offering to the gods is more justly due than if you had obtained the consulship or the command of an army."

Mencius : " Here is now a man who daily steals his neighbour's hens. Somebody says to him : ' This is not the conduct of an honest man.' But he replies : ' I should like to rid myself of this vice by degrees ; until next year I will only take one hen per month, and afterwards I will make an end of the practice.' If you know that your conduct is unrighteous, then stop immediately. Why wait till next year ? "

Epictetus : " When you say that you will turn over a new leaf to-morrow, that is tantamount to saying that to-day you want to be impudent, cowardly, passionate, envious, selfish, or faithless. Only think how many sins you are allowing yourself. ' But to-morrow I shall be a different man.' Why not to-day ? "

Confucius : " From the Emperor down to the mass of the people, one duty is obligatory for all : to correct and improve oneself."

Laziness is unquestionably a disease. You must cure yourself of it.

Do not confuse idleness and rest. Rest does not consist in doing nothing, but in doing something different—that is to say, in exercising other faculties, while allowing those that are tired to recuperate. Rest is essential, whereas idleness is the root of many evils.

Work is doubly moral, because by working, one is useful to oneself and to others.

Alexis de Tocqueville : " There never comes a time for rest in one's life : constant effort both within and without is as necessary, and even more so, when one gets old, as it is in youth. A man in this world may be compared to a traveller who is steadily advancing into ever colder regions, and who is therefore obliged to move more rapidly the farther he gets. The soul's most formidable enemy is the cold. And in order to overcome it, we must maintain the activity of our mind not only by work, but also by contact with our fellow-men and the affairs of the world."

Montaigne: "Old age carves more wrinkles on our mind than on our face."

L. Bourdeau: "The power which animates the universe sets us an example. . . . It never stops, because it is never tired and because its task has no end. The energy which we possess, although small in quantity, being an individualised particle of the energy of the universe, should follow the same laws: activity is the very life of a moral agent."

Do not overtask your strength, however, either mentally or physically, for excess of any kind is always followed by more or less serious consequences.

Prudently distinguish, then, between the effort which tends to the maintenance or enlargement of life and the excessive or over-prolonged exertion which has a weakening effect. We must not diminish life while thinking to increase it.

Do not worry excessively. Epictetus says: "In everything we must do all that lies in our power, and for the rest we must be resolute and calm. I am obliged to go on a sea voyage: what must I do? I must carefully choose the ship, the pilot, the crew, the season, the day, the wind, and that is all that depends on myself. As soon as I have sailed a great storm springs up; that is not my concern, it is the business of the pilot."

Moderate ambition (very moderate) is not an evil. It springs from a lawful desire to provide food for our activity, and to extend the scope of our influence for good.

Are you sad? Then work. Are you discouraged? Then work for others.

If you are inclined to lose faith in humanity, think of the good men of all times.

Is there anything nobler and more consoling than the life of a good man?

Live in constant intercourse with good men; especially Marcus Aurelius, Epictetus, and Confucius, among the ancients. As for the modern writers, make your own choice. Read a page every day, and meditate on it.

Never forget your dead friends. Remember their virtues and try to imitate their noble and generous deeds.

Do not weep over your own sorrows. Do not become maudlin by thinking of the moral or physical pain you have undergone.

Anything that causes depression, diminishes one's stock of energy, or interferes with one's work, is bad. Therefore fight against depression, try to look on the bright side of things, and cultivate a serene and cheerful spirit.

Set apart a little time every night for self-examination. Devote some time each day to quiet meditation and to the inner life.

Be honest with yourself: do not seek to palliate your own faults; do not exaggerate them either, but obtain as accurate an idea as possible of your

moral condition. Think of the qualities which are lacking in you and which you must acquire, of the faults which hold you under their sway and which you must get rid of, and shape your efforts accordingly, without ever losing heart.

Guyau : " In all philosophical reflection there is a consolatory element, arising not so much from itself, for it may be concerned with very sad realities, as indirectly, because by enlarging our thoughts it also enlarges our heart."

Marcus Aurelius : " As your habitual thoughts are, so will your mind be, for our soul takes its colouring from our thoughts."

Never commit a base deed, never tell a lie.

Do not commit base deeds to-day under the pretext that to-morrow you will perform a brilliant, or simply an honest, action.

Do nothing mean. Respect your own dignity. Dignity must not be taken to mean pride, still less vanity.

Ta-Ya (Ode 1) : " When you are in your own private apartment, do nothing of which you would be ashamed, though exposed only to the light of heaven."

Never be vulgar in your thoughts, gestures, words, or actions. If you are obliged to repeat the words of a drunkard or an angry man, mimic neither his voice nor his gestures. You should only imitate what is beautiful.

Be firm, but not stupidly obstinate.

Intelligence is divine, but intelligent kindness is even better.

Do you wish to acquire true loftiness of character? Then be good to others ; but let your goodness be of an intelligent, active, and sympathetic nature, a blend of penetration, patience, inspiring influence, geniality, firmness, and discretion. Your goodness must not be weakness in disguise, nor spring from a desire to "live a quiet life." That sort of goodness only produces indolence and slackness in those who are its object, and causes you to forfeit their respect. Lastly, your goodness to a friend should not make you guilty of injustice towards a stranger.

Marcus Aurelius : " Often one is unjust without doing anything ; it is not only actions that are unjust."

To refrain from doing evil is only the elementary and negative part of our duty ; to do good is the positive or active part of it.

Not to prevent the commission of an evil deed when one has the power is to commit it oneself.

Confucius : " He who sees what is right and does not do it is guilty of cowardice."

Marcus Aurelius : " Justice is the fountain-head of all virtue."

Seneca : " Let me be taught what a holy thing is justice, which is intent only on the rights of others and looks for no other reward than what is derived from its own works. . . . Be it the ambition of every man to say to himself : ' It is my duty to be just without any selfish motive.' Nay, that is not enough ; let him say : ' I will joyfully sacrifice myself for this most lovely virtue ; let me do my utmost to stifle any thought of private advantage to be gained.' Consider not what remuneration will accompany your just action. . . . It matters not at all whether your upright conduct be known to many or to few. He who wishes to have his virtue published abroad is striving after glory, not after virtue."

J. Payot : " When we endeavour to lead a nobler and more intense life, we are conscious of collaborating not only with the wisest and best among men, but with the universe itself."

Let us frequently unite ourselves in spirit with the Whole. Thus shall we come to a better understanding of the way in which we should go, of the goal towards which we should strive ; a great peace will enter into our soul, and at the same time we shall feel a more eager desire to share in the mighty effort of the universe.

L. Bourdeau : " Our feeling of adoration for the divine should manifest itself in impulses of pure love towards the source of all life, in a profound admiration for all the beauty and intelligence that irradiate the universe, and for the wisdom apparent in its laws. By conforming our life thereto, we obtain our share in the divine life,

collaborate in its work, and, as far as our nature allows, participate in its infinite grandeur."

Love beauty under all its forms. Never miss an opportunity of seeing a fine painting, a beautiful statue, a lovely landscape, a gorgeous sunset, a pretty flower, of hearing a piece of beautiful music, and still less, an opportunity of doing a noble action.

Never be weary of admiring the beauties of Nature, for she never wearies of being beautiful.

One need only get away from great cities and keep one's eyes open in order to see how beautiful Nature is at all times.

A storm is raging, and heavy black clouds are driven headlong across the sky. The firmament is rent asunder by dazzling flashes of lightning, and rolling peals of thunder are reverberated by the mountains. In wild fury, the ocean billows hurl themselves against the rocky cliff, only to fall back with a sullen roar, spent by the effort and covered with foam. In the forest you hear the howling and wailing and whistling of the wind, and the boughs of immemorial giants bend beneath the blast. Every twig glitters with pearly drops. Then appears the rainbow, and all is calm once more. The sky clears, and resumes its tranquil hues. The sea lazily spreads out over the shore, and as lazily retires—a rhythmic process eternally repeated, with the murmur of the shingle for its eternal accompaniment.

Let us now climb this mountain side or walk up yonder hill. Noble views, enchanting prospects, open out before our eyes at every step.

All seasons of the year are beautiful. In spring, there are the tender greens of meadow and forest, the earliest blossoms hailed with joy, the song of birds.

In summer, flowers with all their scents and colours, the smell of pines, soft breezes, bright-hued butterflies with wings of silk and velvet, and starry nights.

In autumn, the glory of the foliage, adorning itself so as to be beautiful in death; the forest undergrowth transfigured by the radiance of the setting sun—a glimpse of fairyland!

In winter, the exquisite tracery of frost-covered branches, the soft white carpet of snow on the ground, the grey mist blurring the outlines of the landscape.

In every season, either a blue sky overhead or a canopy of cloud, white, grey, or black, horizontal bands, fleecy mountain-masses, or ravelled threads pierced by rays of golden light.

Always, too, there are sunrises and sunsets, marvellous displays of glowing, melting colour, hardly of this earth.

Thus everywhere in Nature we find æsthetic feeling continually manifesting itself in designed effects or play of fancy. Look at the peacock's feather. The material brought by the blood to the barbules composing each feather is the same for all, yet each part selects a particular pigment and arranges it in such a way as to harmonise with the general scheme. The distribution of these pigments varies in each barbule, and is so contrived that the whole forms an object remarkable both for regularity of design and for beauty of colouring: the eye of a peacock's feather.

Bright colours and harmonious patterns are also found on the bodies of caterpillars, wasps, and beetles, on numerous insects, birds, and fishes, on the mother-of-pearl in sea-shells, and on the delicate wings of the butterfly.

Nature, that incomparable artist, is ever at work creating beautiful things in profusion, just for the pleasure of it. Open your eyes and admire.

Do not feel ashamed to do what is right. Do not be deterred by the scoffing of so-called "friends."

You want to do good, you want to help others? Then put your whole mind, and especially your whole heart, into your acts and into your words; otherwise there will be no result.

J. J. Rousseau: "You may open your purse freely enough, but if you do not open your heart as well, the hearts of others will always be closed to you. It is your time, your care, your affection, it is yourself, which you must give. For whatever you may do, there is always a feeling that your money is not you."

Tzŭ Ssŭ: "The man of perfect sincerity does not limit himself to his own improvement, and stop there: he uses his virtue to improve others as well. To perfect oneself is goodness; to perfect others shows knowledge and wisdom."

Our first altruistic duty is to assist others to fulfil their destiny—that is, to attain their full development.

J. Simon : “ It is our duty, when we believe that some portion of the truth is within us, to endeavour to spread it, to devote ourselves to its service, and to make no account of our personal interests, ambition, or vanity; to persevere unfalteringly and without ever turning back, to do honour and homage to our doctrine by our own conduct, to identify ourselves with the cause that we have embraced, and to be always ready to uphold and defend it, and to sacrifice ourselves for it.”

In what, above all, should your work of proselytism consist? In inspiring others with an enthusiasm for truth and justice and work, and with a passion for intelligent kindness.

In your philanthropic ardour do not imagine that you can make others perfect if your own faults are so great that they stare them in the face. Begin by attending to your own moral advancement, for a living example is more persuasive and convincing than the most eloquent sermons.

How can you preach gentleness if you yourself are violent? Therefore, away with anger and impatience.

If, in a discussion, something is said that annoys you, do not reply, no matter how much you may feel inclined to do so. If you receive a letter which irritates you, do not answer it immediately, if at all: beware of anger. Anger is closely related to madness.

Boulaq Papyrus : " No good is to be gained by speaking evil."

Do you wish to do something foolish ? Then listen to the promptings of your evil temper.

Epictetus : " If you insult a stone, what will it advantage you ? It will not listen to you at all. Imitate the stone, and do not listen to any insult that may be addressed to you."

Boulaq Papyrus : " Speak gently to one who is angry ; it is the best way to soothe his feelings."

M. Guyau : " He who gives way to violence is stifling the sympathetic and intellectual element in his nature—that is to say, the part of him which, in an evolutionary sense, is the highest and most complex. In treating others with brutality, he becomes more or less brutalised himself. Thus violence, which at first sight is a triumphant outburst of inward power, evinces itself in the end as a narrowing influence."

Be virtuous without ostentation. Do not be always preaching, but never be weary of setting a good example. Be sparing of words, but rely on the example of a lifetime.

Mencius : " I have never heard that a man of tortuous conduct has succeeded in making others upright and sincere."

Confucius : " Let your words correspond with your acts, and your acts with your words."

Think of others always and of yourself as little as possible.

Do you fear that your efforts are useless? Then redouble them.

You say you have nothing to give this poor man? You are wrong. You can give him a word of encouragement.—You cannot give even that? Then give him a brotherly smile.

Love all men, for every man is what you are—a part of the Whole.

Extend the horizon of your sympathy as far as you can. Love everything : plants, flowers, lakes, seas, animals, clouds, stars, mountains, valleys, sunsets, all men, especially those who suffer.

M. Guyau : “ In the society of the future, the sentiment which will require most development is that of universal sympathy.”

Spare a thought every day to those who are suffering.

Boulaq Papyrus : “ Eat no bread, while another is standing by, without stretching out your hand to get bread for him too.”

Do not only dream of noble deeds, but do them.

Think not merely for the sake of thinking, but with a view to doing. Let thought and action go hand in hand.

Meditation should only be the prelude to action.

The chief value of thoughts lies in the acts which they engender.

Rondelet : " The solitude of the soul is to be feared as a perpetual temptation to selfishness and pride."

Devotion to others is admirable ; devotion to an idea is sublime.

You think that children's intelligence is too limited to understand the nobility of sacrifice. You are mistaken. Children understand almost instinctively the most elevated sentiments, and the most generous ideas.

Treat your friends with kindness, and your enemies with indulgence.

Be very lenient to those who have done wrong ; you do not know how many times they have resisted temptation, you do not know how long they struggled before they fell. Perhaps, in spite of their fall, they may be better than you, who have never been tempted.

Be hard on yourself, but not on others ; your example may, perhaps, make them more severe towards themselves.

Never make use of coarse expressions.

Never use any contemptuous words ; what right have you to despise one of your brothers ? Never humiliate any one by word, look, or gesture.

Boulaq Papyrus : " Beware of sinning in thy speech ; see that it contain no sting."

Do not say, " So and-so is a thief." But, if it is absolutely necessary, say, " So-and-so has committed a theft." You see the difference ?

Marcus Aurelius : " Acquire the habit of lending an attentive ear to the words of others, and enter as far as possible into the thought of the speaker."

A. Clermont : " If anyone comes and tells you his troubles and griefs, lend him a friendly ear, with earnest attention, and without thinking of yourself ; without encroaching too far on his time and your own, offer him kindly the best advice that occurs to you after due reflection, but be very careful not to reciprocate or to outdo him by the relation of your own sorrows, which, by the way, will always appear worse in your eyes than those you have been listening to."

Seneca : " I would have people refrain from lamenting over sufferings which have long receded into the past ; let us not hear them exclaiming : ' Never was a man more wretched than I ! What torture, what agony, have I not undergone ! ' All that, even if it be true, is a thing of the past. What is the good of reopening old wounds and perpetuating former unhappiness ? Is it not strange, this mania men have for exaggerating their misfortunes and wilfully deceiving themselves ? . . .

Away, then, with this harping on the troubles of the past, away with all dread of what is to come ; the past is nothing to me now, the future cannot affect me yet."

Which is the better of any two men ? It is he who understands best and feels most strongly that he is a part of the Whole, and a particle of the Universal Energy.

Tsêng Tzŭ : " What a man dislikes in his superiors, let him not display in the treatment of his inferiors ; what he dislikes in inferiors, let him not display in the service of his superiors. What he disapproves in those who are before him, let him not practise on those who are behind him ; what he disapproves in those who are behind him, let him not practise on those who are before him. What he hates to receive on the right hand, let him not bestow on the left ; what he hates to receive on the left, let him not bestow on the right. This is what is called the reason and rule of all conduct."

Fulfil all your duties towards your country.

If you possess the right of voting, illness is the only cause that should prevent you from recording your vote. Not to give one's vote to an honourable man is a crime.

If it is necessary, take your part unhesitatingly in the administration of your town or of your country.

Help in some useful work. Support it with your money, if you can do nothing else.

Dr Forel: "Work in itself is not enough; besides the work by which he earns his living, every man should do a certain amount of social work. Without social work, whether it be done in public or kept modestly out of sight, there is no true morality."

You ask what politeness is. It is kindness in small things.

Reply as soon as possible to the letters you receive. In ordinary conversation you reply at once; why not do the same in written conversation?

When engaged in a discussion, do not be obstinate and overbearing. Simply state your arguments, and let that suffice. Do not drive your opponent into the last ditch, or force him to acknowledge his defeat. If you refrain from humiliating him, perhaps your words may bear fruit in his mind later on.

If you play a game, do not crush your opponent by your superior play, and do not ostentatiously show off your skill. Be generous. In doubtful cases, always give your adversary the benefit of the doubt. If you lose, do not look sulky, and never say that the other man "won through a fluke," but acknowledge frankly that he played better than you.

Acquire the habit of seeing the qualities rather than the defects of those about you.

When I tell you that you should be kind, I do not mean that you must be so only on great occasions—that is to say, rarely. On the contrary, you must be constantly kind. Kindness may be shown in a thousand ways and in the smallest things ; only, one must think of them. For instance : when you come home late at night, make as little noise as possible ; your neighbours may be asleep, and you have no right to waken them by slamming the doors, stepping heavily, and throwing your boots noisily from one end of the room to the other. Above all, do not begin or continue to play the piano or sing when you think that your neighbours are in bed. You have no right to prevent others from sleeping because you are not sleepy yourself. After a certain hour, let no one hear you make a sound.

You should not depart this world without leaving it a little better than you found it. You may reply that your position is too humble for you to have any influence. But you can surely afford those who live with you an example of calmness and gentleness, justice and devotion, and ceaseless striving after the right. Does that count for nothing ?

If you are in doubt whether to do a thing or not, just ask yourself if you would be glad to-morrow to have done it.

Suppose you are ill. You know what is required of you : patience and courage, gratefulness towards those who are nursing you, strict compliance with the doctor's orders, and an example of gentleness and kindness to everyone with whom you are

brought into contact. When the pain is less severe, avail yourself of the opportunity for quiet inward meditation.

Confucius : " Moral virtue consists in being able, anywhere and everywhere, to exercise five particular qualities : self-respect, magnanimity, sincerity, earnestness, and benevolence."

Marcus Aurelius : " Benevolence is invincible, provided it be sincere ; for what can the wickedest of men do to you, if you persist in treating him with gentleness ? Suppose you exhort him quietly when the opportunity offers, and speak to him without anger, when he is trying to do you some harm, somewhat in this strain : ' No, my good sir, you mistake the object of life. It is not I who will suffer harm, it is you who are harming yourself ! ' Contrive to make him see, by a general presentment of the case, that this is Nature's rule, and that neither bees nor any of the animals that are naturally gregarious adopt his line of action. Do not fall into a scoffing or insulting tone, but show that you are actuated by genuine goodwill and kindness that cannot be soured by resentment ; do not behave like a prig, nor bid for the applause of the company, but keep your mind fixed on him alone, even if others should happen to be by."

M. Guyau : " The man of action has no time to waste on self-pity. The widening of human sympathy is the antidote to all the sufferings of the modern brain."

M. Guyau : " The true remedy for all sufferings is to increase the activity of the mind. . . . Action

is the grand palliative for suffering. This explains the power of charity to assuage personal grief, in which there is always a slight tinge of selfishness. There is no better way of comforting oneself than to bring comfort to others."

Never tell a lie even in jest, especially to a child. A lie, like every other mistake, intentional or otherwise, can never be anything but an evil, and productive of evil.

Remember that physical, mental, and moral qualities, as well as defects, are handed down by parents to their children. Their ways of feeling and thinking are inherited as well as their predisposition to such and such a disease. If a child is untruthful, lazy, dishonest, deceitful, and passionate, if he has a tendency to certain illnesses, it is because he resembles either his parents or his grandparents, or, less frequently, ancestors still more remote. Young man, it behoves you then to choose your wife with the greatest care. My dear girl, be also extremely careful in your choice of a husband.

A. Martin: "As regards the family, it may be said that the work begun by heredity is continued by the force of example, for the qualities and defects of parents are transmitted to their children in the first place by consanguinity, and afterwards by the example that they set them. Hence one is sometimes shocked at the thought of the unfavourable conditions under which education is too often carried on in the family circle. How are parents, we wonder, to contend with the vices that they themselves have begotten in their offspring, in

which they continue to indulge before their children's eyes, and of which, in many cases, they are not even conscious? How can generous, high-minded souls find room to develop in a family where mean and narrow ideas prevail, where base and covetous instincts flourish? How are the children to be simple, modest, and industrious, if they grow up in an atmosphere of luxury, ostentation, and self-indulgence? . . . It is the influence of habit, combined with that of example, that constitutes, in our opinion, the most potent instrument of moral training."

Parents, be careful with whom your children associate. If a child has a friend whom he admires and is intimate with, he always has a tendency to imitate him in everything, and for a time the influence of such a friend is strong enough to eclipse that of parents and teachers. Be watchful, therefore.

Nicole: "What we read falls upon the soil of our minds like seed, and germinates from time to time in thoughts and desires." And likewise what we see and hear. Once more, then, O parents, keep watch.

Instead of teaching your children ethics in the abstract, instil into them good habits: the habit of work thoroughly done, the habit of cleanliness, the love of truth, self-respect, and respect for others, gratitude, courage, perseverance, co-operation, and discipline. Teach them, by stories drawn from actual experience, to respect the weak, to love their native place, their mother-country, and the great world in which they have their being.

Use poetry and science as a means of exciting their love and admiration for Nature to the highest point. Kindle in them a passionate love for the Whole. Foster their virtuous impulses, for conduct is largely determined by feeling and impulse.

Do not say to a child : " Work and you will be rewarded ; be good and you shall have a sugar-plum." You must tell him early in life : " Work and be good because it is right, because your self-respect requires it, because it accords with the plan of the Whole." Do not fear to make the child understand that he is a tiny part of the Whole, and must work in the same direction as the Universe.

Guizot : " If you are unable to stimulate your child's will except by promise of a pleasure, pleasure will become his guiding principle and the whole object of his efforts ; doing his duty will be nothing more to him than a means of attaining his object, a secondary motive which his mind will not invest with the moral elevation and importance that are proper to it."

If you work constantly to attain perfection, if you sacrifice yourself continually for others, if you spend your whole life in doing good in every possible way to all around you, you will, nevertheless, have done nothing moral, and you will not be worthy of any respect, if it has been done in the hope of receiving a reward in this world or the next. You will simply have proved yourself a practical man, who, according to the popular saying, " uses a sprat to catch a salmon." Call yourself a dealer in good works, if you will, but do not imagine that you are a man of virtue. Do

your duty because it is your duty—there is no other worthy motive. Do a thing because it is moral, and because it is desirable that the thing should be done, but never think of the reward, nor desire it. What is right must be done without thought of self.

Instead of setting up the very low and vulgar ideal of rewards for goodness, try to make people realise the intrinsic nobility there is in doing a thing merely because it is morally beautiful, and they will do it, for the heart of man is really nobler than people generally suppose. Develop in men the feeling of personal dignity and of self-respect, and they will easily do without the hope of a reward, or the fear of punishment; they will be above both.

L. Bourdeau: "When virtue is regulated by profit, it degenerates into a process of clever calculation, and well-doing becomes nothing more nor less than a profitable investment. True morality is of a disinterested nature and aims only at the inward satisfaction of having observed the 'law.'"

Seneca: "The reward of a virtuous deed is the doing of it."

Kant: "Man reaches his highest state of perfection when he does his duty from a sense of duty."

Guyau: "The purest form of moral sentiment consists in doing what is right for its own sake."

The true reward of a good deed is that it makes one a better man.

Marcus Aurelius : " One man, when he has done you a kindness, hastens at once to enter it against your name in his account. Another may not be in quite such a hurry, but nevertheless he retains a lively recollection of what he has done, and looks upon you in the light of a debtor. A third sort dismisses the matter altogether from his mind. He is like a vine which bears its grapes and is satisfied with being fruitful after its kind, asking for nothing in return. He does not proclaim his deed from the house-tops, any more than a horse that has won a race, or a hound that has run its quarry to earth, or a bee that has made some honey. He simply passes on to another generous action, just as the vine gets ready to bear a fresh lot of grapes in the following season."

Marcus Aurelius : " When you have done a good deed, and another has benefited by it, why try for yet a third thing, and be anxious that your goodness should appear to the eyes of the world or excite a sentiment of gratitude ? "

When you educate a child, what is the object that you keep in view ? You try to make a good man of him by the harmonious development of his faculties and all the active sides of his character. That is exactly what you should constantly strive to achieve for yourself, no matter what your age is, for in this respect every one is still a child.

You will find yourself from time to time inspired with a strong desire to become a virtuous man. Do not check that rising of the moral sap, but begin at once.

Confucius : " The higher type of man is catholic in his sympathy and free from party bias ; the lower type of man is biassed and unsympathetic."

Plato : " You must not injure any man, not even the wicked."

Do not be sparing of words of encouragement. Upright men require them in order to persevere, and the others need them still more in order to change their ways.

Do not boast of the good that you do, as if it were an extraordinary thing.

Epictetus : " You pity the blind and the lame. Why have you no pity for the wicked ? They are wicked in spite of themselves, just as the others are blind and lame."

Marcus Aurelius : " The best revenge one can take is not to become like the wicked."

Every morning when you wake up, give a thought to those who are seeking for truth and wish to do what is right. Associate yourself with them in spirit by your love of righteousness and truth, and by your desire to do better day by day.

Have compassion on animals. Never hurt them voluntarily. Kill them only when it is absolutely necessary, and always as humanely as possible. Animals are also particles of the Whole. Never use traps that cause long suffering to the victims. Never " go out shooting," for you often wound poor beasts that crawl away into some corner and die,

after days and days of agony. There are plenty of open-air sports and exercises which may very well take the place of hunting and shooting. Then, at any rate, you will not incur the disgrace of obtaining your amusement at the cost of suffering. Your pleasures ought never to be productive of pain. Your delights must never involve the misery of others, be they men or beasts. The infliction of suffering and death for one's own amusement is brutal and degrading to the last degree.

Never inflict useless pain. Destroy as little as possible. Is not that the best way of showing your respect for the Whole?

Régi Michaud: "That the love of life—a wonderful force whose triumph is assured—should be instilled into us is all to the good. Nearly all of us are afraid of death, but few indeed are the true lovers of life. To love life is not to hug it like a miser—just the contrary. None are more ready, more happy to die than those indispensable ones, bright and helpful souls who adore life for its own sake and for the noble uses to which they can turn it. He loves life who will sacrifice his own to save his child, in whom he lives again; he loves life who will yield it up for the glory of the race in which his life is continued. Love of life is shown in resisting, by one's powers of reason and energy of character, the deceitful pleasures that seek to undermine it; in confronting sickness and dangerous passions and evil enticements with a will that is stronger than they; in refusing to yield to the foolish and fatal preference for sensation as opposed to duration; in priding oneself on the preservation of one's being as a whole, and in abstaining

from transient delights, unlawful thoughts, and hysterical excesses which last but an instant and soon shatter one's self-respect ; in looking steadfastly to the future, on which one is conscious of having a rightful lien ; in making no cowardly concessions to the enemy."

L. Bourdeau : " Suppose the majority of men were honest, just, gentle, peaceful, forbearing, and ready to help, in the same degree as a few choice spirits among us, who show what human nature is capable of at its best, the happiness of the human race would not leave much to be desired. And in order to realise this ideal state of society, what is it necessary for us to change except ourselves ? "

J. Payot : " Ah ! if only half a dozen students went back to their native villages or towns every year as doctors or lawyers or professors, fully resolved to treat every man, however modest his station in life, with the greatest respect ; resolved never to allow an act of injustice to pass without making an energetic and undaunted protest ; resolved to introduce more true kindness, equity, and tolerance into social intercourse ; then, in twenty years, a new aristocracy, thoroughly respected and all-powerful for the general good, would have emerged, to the great and lasting happiness of the country, and of every part of the country."

L. Bourgeois : " Be useful. As you know, nothing is ever lost, and the vibration of the tiniest atom, being imparted to its neighbour, continues *ad infinitum*. In the same way, the

smallest act of goodness and justice adds something to the general advancement of humanity. Let your life be an effort, merged in the united effort of mankind at large. However insignificant your strength may be, however feeble the impetus you have given, you need have no fear. Your effort is not lost."

L. Bourdeau : " The human being who wishes to enjoy a complete life must first develop his own powers of activity, and then disseminate the same activity amongst the various groups to which he belongs. He cannot wrap himself up in a narrow, sordid egotism without forfeiting the fuller, more extended vitality which comes from a wide participation in the life of the social series. The only rule which can be laid down in a general way is to prefer a higher duty to a lower one, to choose that which will produce a greater rather than a lesser quantity of life."

In order to get the fullest value out of life, we must have a reason for living—that is to say, an object or ideal towards which our efforts may be constantly directed.

Godin : " But the law of life is not merely a law affecting individual and species : it is also the general, universal law on which depends the solidarity of both individual and species with the Universe.

" In order, then, not to infringe the fundamental law of his existence, man must watch over the preservation, development, and equipoise of his own life ; but, as the criterion of his merit is his activity in helping to bring about the greatest

possible sum of life, it is not enough that he should work only for himself ; it must also be his task to foster, develop, and bring into equipoise the life of his fellow-men, as well as the life that lies about him in Nature. That is the object of human life, that is Progress :—the development of life as a whole upon this earth, so that it may co-operate in the maintenance and equipoise of Life Universal, towards which each human individuality contributes its share.”

Godin : “ Then and always, the crowning principle will be the preservation, development, and equilibration of the life within you and around you, for your fellow-men as well as for yourself, and all the acts of your life will be accounted just so much to your credit as they have been of value to life itself.”

Epictetus : “ We write down beautiful maxims, but are we thoroughly imbued with them, and do we put them into practice ? ”

Part IV

On Death

You think of the pain that you will feel, as you imagine, at the moment of death, and you are afraid.

But you must remember that death is very seldom a painful ordeal. It is almost certain that your end will be preceded by a feeling of actual comfort, or at the very least by a cessation of pain. For the carbonic acid in the blood being no longer eliminated, it will gradually accumulate and benumb all sense of pain, sending you to sleep like any other anæsthetic. Being thus free from suffering, you may be led to think that you are on the road to recovery, and you will begin to make plans for the future. And then you will fall asleep in the land of Peace.

But even if you are under no such misapprehension, and your mind is lucid to the last, you will contemplate the approach of death without terror, anxiety, or emotion; you will not dread it, you will calmly await it, and that without any effort on your part, but as something quite in the natural order of things. It is Nature's ordinance. And, indeed, the fear of death which Nature has put into us disappears as soon as all hope of life is gone. We are only afraid of death so long as there is a possibility of its being avoided, and

so long as our efforts to do so are of any avail ; but when once this possibility has vanished, our fears vanish as well.

This fear of death, when the end is still remote, is a proof of Nature's foresight. If death had no terrors for us, we might be seeking it on the slightest provocation, or at any rate we should make no effort to avoid it ; whereas it is Nature's desire that life should be continued. On the other hand, it is Nature's habit to inflict only the minimum of pain, and that is why our fear ceases when there is nothing to be gained by further struggle ; the very wish to live disappears at the same moment. Death, then, is only dreaded during the fullness of life ; the nearer it approaches, the less terrifying it becomes.

If you have ever stood by the death-bed of one of your family, you may perhaps have witnessed his final convulsions and heard the death-rattle in his throat ; your heart was then full of pity for him, and also for yourself, when you thought of what your own last moments would be like. Yet why be alarmed ? The spasms of the dying are all purely reflex (in a physical sense), unconscious, and free from pain, and the breathing which seems so laboured causes no suffering at all. All pain, physical or mental, vanishes at the near approach of death. Would you have proof ? Then question those who have come back to life after being on the brink of dissolution. They will tell you that they have no recollection of any suffering, and that what they experienced was nothing more dreadful than the gradual enwrapping of their senses in a tranquil sleep.

William Hunter said a short time before he died : " If I had the strength to hold a pen, I

should like to use it to express how easy and pleasant it is to die."

"But," you say, "all men do not die of disease, many are killed by accidents." A violent death is much less painful than you imagine; one might even say that as a general rule it is not painful at all. You have already heard what Livingstone has to say on the subject. Thrown to the ground, with his shoulder mangled by a lion, and the animal itself crouching over him, ready to crush his head between its jaws, Livingstone suffered no sensation either of pain or fear, although he was perfectly conscious of all that was taking place. Fear for him was non-existent, and he was able to look upon the beast without horror.

So, too, with regard to the many big-game hunters we have mentioned.

The victims of carriage, motor, and bicycle accidents are likewise unanimous in declaring that neither alarm nor pain is felt at the time, but at the most a vague sort of surprise. Thus we can assume that if death were to take place immediately after the accident, there would be no suffering at all.

We will content ourselves with a single case in point, that of Sir Francis Younghusband, who won distinction in Thibet.

While he was on leave he paid a visit to Switzerland. There, he tells us (we abridge his narrative; for a full account, see his book *Within*): "We were returning from an aviation meeting along with a number of other pedestrians and several motor-cars, and were out in the country about three miles from a town. There was no pavement, so we had to walk in the roadway. Suddenly my companion shouted: 'Look out!'

. . . There was no time to think what to do. I could only give a desperate spring in the air, I suppose in some vague effort to escape being crushed under the wheels. Then came the crash. I seemed to be whirling in a wild struggle with the machine. With arms and legs I fought instinctively to free myself. . . .

"Was it to be death? It seemed it must be. The machine was too relentless, too impossible to struggle against. And if death had resulted, it would have been absolutely painless, for no pain had yet come. There would have been simply extinction, without suffering and without thought. . . . In an instant the full current of life with all its unfulfilled purposes and ties of love and affection would have been brought to a stop. But I myself would have felt as little as an electric lamp when the current is switched off. The light would have gone out, but there would have been no pain.

"But it was not to be death. I was flung contemptuously to the far edge of the road, and there I sat dazed but conscious, still without pain, but aware that a serious accident had happened, and fearful of the shock it would give those most dear to me.¹

"In a stunned way I gazed at the collecting crowd, at the motor-car, at the scared faces of the ladies inside, at the gendarmes taking notes. But I was unaware where or how I was hurt, or whether I was hurt at all. Then I heard my companion murmur to himself, 'Broken leg,' and I saw that my left leg was curled under me. I suffered nothing, and my feeling at the moment was one of comfort

¹ This thought of the anxiety that will be felt by those we love nearly always rises to the mind at the moment when an accident occurs.

at being able to sit cross-legged so easily, for my leg felt elastic and soft as putty. I saw, though, that it was the case that my leg was broken, and I vaguely wondered what other injury I might have suffered. . . .

"Unfortunately no temporary splint was made, and during the drive back—the last mile over Continental cobble-stones—the jars were terrible, for now the pain was beginning, and I winced at each fresh bump the motor made.

"Both bones of my leg had been broken and were sticking through the flesh. . . . Tendons, muscles, and nerves were also torn, and I had a deep flesh wound on the opposite knee."

Edward Whymper, the Alpinist, writes of a fall he experienced on the Matterhorn, as follows:—

"The bâton was dashed from my hands, and I whirled downwards in a series of bounds, each longer than the last; now over ice, now into rocks, striking my head four or five times, each time with increased force. The last bound sent me spinning through the air, in a leap of fifty or sixty feet, from one side of the gully to the other, and I struck the rocks, luckily with the whole of my left side. . . . As it was, I fell nearly two hundred feet in seven or eight bounds.

"As it seldom happens that one survives such a fall, it may be interesting to record what my sensations were during its occurrence. I was perfectly conscious of what was happening, and felt each blow; but, like a patient under chloroform, experienced no pain. Each blow was, naturally, more severe than that which preceded it, and I distinctly remember thinking: 'Well, if the next is harder still, that will be the end.' Like persons who have been rescued from drowning, I remember

that the recollection of a multitude of things rushed through my head, many of them trivialities or absurdities, which had been forgotten long before; and, more remarkable, this bounding through space did not feel disagreeable. But I think that, in no very great distance more, consciousness as well as sensation would have been lost, and upon that I base my belief, improbable as it seems, that death by a fall from a great height is as painless an end as can be experienced." (*Scrambles amongst the Alps.*)

Admiral Beaufort, who in his youth fell into the water, says: "As soon as I ceased to struggle, the first tumult in my brain was succeeded by a feeling of calm and almost perfect tranquillity: it was apathy, not resignation, because drowning did not seem to me a bad thing. I no longer thought of being saved, and I did not suffer in any way. On the contrary, my sensations were rather agreeable than otherwise, being something like the comfortable feeling of drowsiness which a tired man experiences before dropping off to sleep."

Dr R. W. MacKenna in *The Adventure of Death* tells us:—

"A young man who fell from the roof of a lofty building and escaped, miraculously, with a handful of bruises, assured me that in his long fall to earth, which seemed to cover an eternity, he did not feel the slightest fear; and I have been told by three medical men, each of whom narrowly escaped drowning under entirely different circumstances, that when their fate seemed certain all fear was taken from them. One of them tells me that at the moment of his greatest danger he felt quite unconcerned, and did not experience the slightest anxiety until he was about to be rescued,

when he was unexpectedly assailed by a timorous wonder as to whether the rescue-boat would reach him in time. So long as he had no hope of safety, he had no fear. Another assures me that the alarm which attended his discovery, that he was being swept away powerless before the tide, rapidly gave way, as his strength became exhausted, to a comfortable condition of indifference, and his last thought before he lost consciousness was one of quiet amusement. He saw a fussy but futile gentleman dash frantically from the beach into the sea, with heroic but indeterminate intentions of bringing succour, and, after thoroughly wetting himself, retire hastily to the beach again. This was the last thing he remembers seeing before unconsciousness supervened, and the sight provoked him to the thought, 'What a funny thing to do!'

"Sir J. F. Goodhart, one of the most eminent of London's consulting physicians, when a resident doctor in Guy's Hospital, arranged with the sister in charge of his wards that he should be called to every patient who seemed to be dying. 'I wanted,' he says, 'apart from my duties, to obtain also some actual knowledge of facts that foretell immediate dissolution.' And out of those trying experiences he gathered these grains of comfort: 'I am never tired of saying, because I am sure it is as true as it is comforting, although in opposition to the general belief, that death has no terror for the sick man'; and also this: 'There is nothing terrible to the dying in death itself. The veil between two worlds is but a cloud, and one passes through it imperceptibly.'

"Those who have seen much of death are agreed that it is often a difficult matter to determine the

precise moment at which the final change occurs, so imperceptibly and quietly does life merge into death. There is no physician who has not stood, many a time, in a hushed room, with a finger on a flickering pulse, and watched the end supervene so gently, that not till he had placed his stethoscope over the heart could he be sure that 'life's fitful fever' was over. This is how the great change usually supervenes in old people—a gradual somnolence, passing by gradations into a deeper and deeper slumber till, as the ancient Greek philosopher Diogenes of Sinope said, 'One brother begins to embrace the other,' and sleep is swallowed up in death. In most cases they

'Drift on through slumber to a dream
And through a dream to death.'

The death of a child is often as imperceptible, and at any age the end may occur so quietly as to be almost unobserved."

It appears, then, as many people know by experience, that there is some beneficent machinery which, in the event of an accident, fulfils the same function as carbonic acid in the case of death from disease.

In short, there may be suffering during an illness, but there is none at the moment of death.

Death itself is absolutely devoid of pain, resembling in this respect a deep and tranquil slumber.

L. Bourdeau: "The proper spirit in which to meet death is one of resignation, or, better still, of cheerful acquiescence and fortitude. In order to rob death of its sting, it is not enough to submit to it without recalcitrance; it must be accepted without sadness, welcomed, and even greeted with a smile.

The superior quality of reason is shown in recognising not only the necessity but also the utility of death, and in approving the law which ordains that we shall come to an end. . . . By our voluntary acceptance of it as a stern obligation, the payment of a debt of honour, and the fulfilment of a final duty, the act of dying becomes a moral act, which has its sanction as such, and finds its reward in the peace and tranquillity of a virtuous end. Let us clear our mind of visionary terrors, trust to the principle of order underlying the course of natural events, and, when our last hour has struck, sink placidly into the bosom of the infinite. . . . Let us enjoy life as a temporary participation in the universal reality, but let us assent to death as to the law of renovation embracing all living things, by which the finite is re-absorbed into the infinite. Let us know how to live, and show ourselves not unwilling to die."

Marcus Aurelius: "Do not despise death, but accept it with resignation as one of the things which Nature desires. Do we not undergo the transition from childhood to adolescence, from adolescence to manhood? Do we not increase in years and stature, cut our teeth, grow beards, and see the whitening of our hair? . . . The dissolution which comes with death is nowise different in kind from these natural changes that accompany each stage in the journey of life. Therefore it behoves the wise man to show for death neither contempt nor repugnance nor disdain, but to await its coming as one of the functions of Nature."

Marcus Aurelius: "What is death? If it be contemplated by itself and in the abstract, stripped

of all the accessories with which our imagination invests it, we shall see in death nothing but an operation of Nature ; and to dread an operation of Nature is pure childishness. Further than that : it is not only an operation of Nature, but an operation which is advantageous to Nature."

Epictetus : " Death must come to us sooner or later. In what occupation will it find us engaged ? A husbandman will be occupied with his labours on the land, a gardener will be busy with his garden, a merchant will be engaged in trading. Tell me, what will *you* be doing in your last moments ? As for me, it is my fervent wish that I may be found engaged in the task of disciplining my will, so that I may execute this final act as a free man should, without agitation, impediment, or constraint."

Marcus Aurelius : " It is for our good that Nature is forced to act as she does."

Marcus Aurelius : " Whatever is agreeable to thee, O Universe, is also agreeable to me. Nothing can be either belated or premature if it be seasonable for thee. Everything that time brings with it is to me as welcome as the taste of refreshing fruit. From thee all things proceed, O Nature ; in thee all things are embodied ; to thee all things return."

Remember that you only exist through the Whole, in the Whole, and *for* the Whole. One of the things which prove that you are living not for yourself, but solely in order that the Whole may live, is the fact that your existence as an individual being or personality has but an infinitely short duration compared with the infinite time that has

preceded and the infinite time that will follow this brief moment. Your life, even if it lasts for a whole century, is in relation to eternity but a lightning flash between two infinities. It is just as absurd to believe that you exist for yourself alone (or that everything has been created for your benefit) as it would be for the lightning to imagine that it also exists for itself, and that earth and clouds have been created for no other purpose than to enable it to live for a fraction of a second, sandwiched between two infinities.

Both man and lightning flash participate in the life of the Whole, but only in order to contribute their share to the activity of the Cosmos, and to help it to live its grand life. One advantage, however, that man has over the lightning is that the process of co-operation, in his case, may be carried out with love and intelligence.

The Universe is an immense reservoir of energy, of which man forms an infinitesimal part. This infinitesimal part, after having had a personal existence for a very short space of time, reverts to the Whole. Why, then, should you fear death, since death is only a reversion to the Whole out of which you came?

Marcus Aurelius : " At present you exist as part of the Whole. By and by you will be absorbed into the being which produced you, or rather you will undergo a change and be remoulded by its generating power."

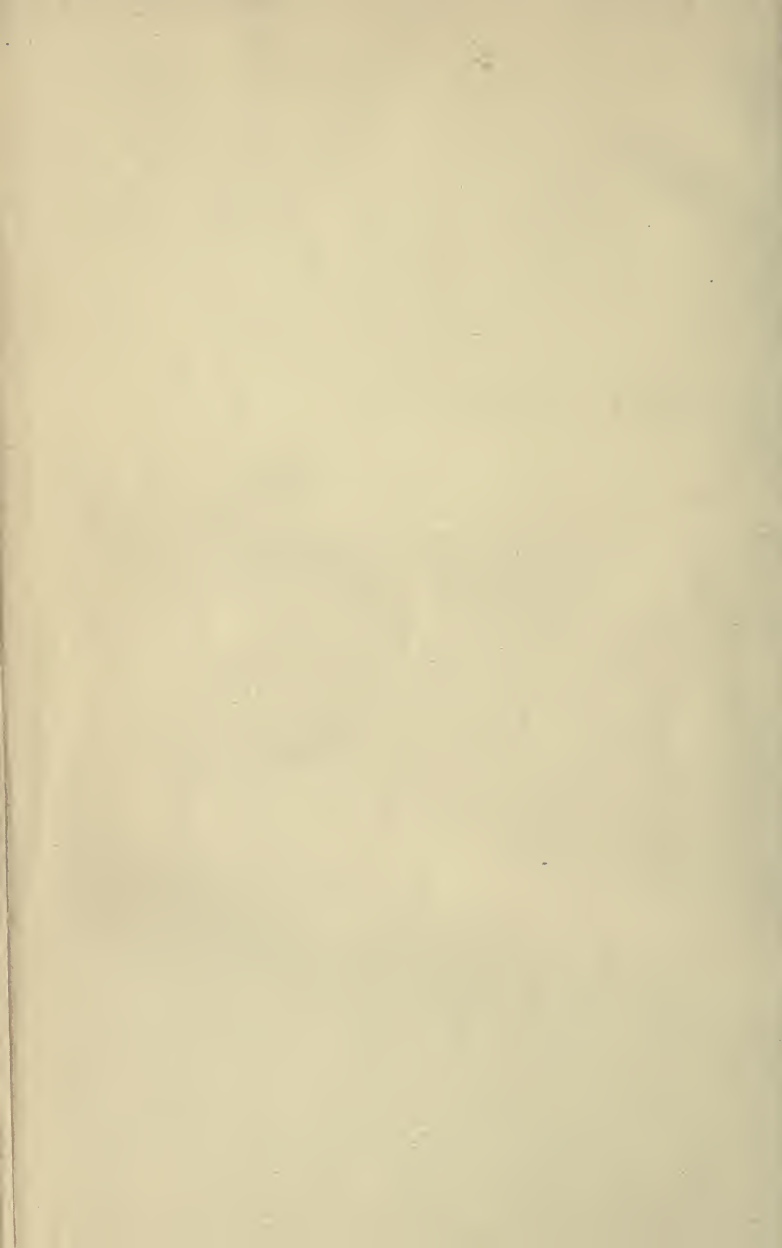
Marcus Aurelius : " We must depart from life with resignation, even as if a ripe olive falling

should praise the earth its foster-mother, and give thanks to the tree that produced it."

Marcus Aurelius : " Death is hanging over your head : while you are still alive, while you still have the power, try to become a good man."

Remember that death is lying in wait for us all—for you and for those around you. Take advantage, then, of the present opportunity for showing your affection to all ; soon it will be too late.

Love life passionately, but do not fear death ; do not fear it for yourself. Your death will cause pain only to those whom you leave behind : that is the sole thought which ought to sadden you in that supreme moment.



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